NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

**THE SUNSET SUPPLY BASE:
LONG TERM COTS SUPPORTABILITY,
IMPLEMENTING AFFORDABLE METHODS AND
PROCESSES**

by

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March 2003

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This thesis represents a cross Systems Command (NAVSEA/NAVAIR) developed product. The product – the Sunset Supply Base (SSB) system - provides a complete system for addressing the risks and supportability issues involved with Commercial Off the Shelf (COTS) products in Navy combat and support systems. The SSB system was implemented on three Navy combat weapon systems at various phases of the product development life cycle. The main body provides to the Program Management Offices (PMO) and other decision makers, a high level summary of performance expectations. Appendix A – The Sunset Supply Base Architecture – identifies at a high level of abstraction a collaborative architecture providing a roadmap for design and development of the SSB system. Appendix B – The Systems Engineering Development and Implementation (SEDI) plan – is a prescriptive or "How to" manual describing activities that have been used to successfully implement the SSB system. Appendix C – Business Case Analysis (BCA) – presents the data collected as a result of SEDI plan implementation then addresses the business/programmatic attributes showing the viability and value proposition possible through the SSB system. Appendix D – The Marketing Plan for the SSB system - defines methods and practices necessary to establish the SSB system as the alternative of choice.

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THE SUNSET SUPPLY BASE: LONG TERM COTS SUPPORTABILITY, IMPLEMENTING AFFORDABLE METHODS AND PROCESSES

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ABSTRACT

This thesis represents a cross Systems Command (NAVSEA/NAVAIR) developed product. The product – the Sunset Supply Base (SSB) system - provides a complete system for addressing the risks and supportability issues involved with Commercial Off the Shelf (COTS) products in Navy combat and support systems. The SSB system was implemented on three Navy combat weapon systems at various phases of the product development life cycle. The main body provides to the Program Management Offices (PMO) and other decision makers, a high level summary of performance expectations. Appendix A – The Sunset Supply Base Architecture – identifies at a high level of abstraction a collaborative architecture providing a roadmap for design and development of the SSB system. Appendix B – The Systems Engineering Development and Implementation (SEDI) plan – is a prescriptive or "How to" manual describing activities that have been used to successfully implement the SSB system. Appendix C – Business Case Analysis (BCA) – presents the data collected as a result of SEDI plan implementation then addresses the business/programmatic attributes showing the viability and value proposition possible through the SSB system. Appendix D – The Marketing Plan for the SSB system - defines methods and practices necessary to establish the SSB system as the alternative of choice.

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LIST OF ABBREVIATIONS AND ACRONYMS

1^{st} Piece	First piece of production
AN/ASQ-20X	Sonar Mine Detecting Set developed for the Navy under the program management code PMS-210
AR	Acquisition Reform
Assy	Assembly
BCA	Business Case Analysis
BOM	Bill of Material
CLS	Contractor Logistic Support
COTS	Commercial Off the Shelf
COTS/NDI	Commercial Off the Shelf/Non-developmental Item
DAD	Defense Acquisition Deskbook
DAU	Defense Acquisition University
DoD	Department of Defense
E&MD	Engineering and Manufacturing Development, a product development phase
ECP	Engineering Change Proposal
EOL	End of life
EOP	End of production date
FAR	Federal Acquisiton Regulations
GIDEP	Government and Industry Data Exchange Program
ILS	Integrated Logistics Support
IPT	Integrated Product Team
ISEA	In-service Engineering Agency
IT	Information Technology
JALB	Joint Aviation Logistics Board
LCC	Life Cycle Cost
LTB	Life of Type Buy (also referred to as LOT Buy)
Mil-Specs	Military Specifications
NAS	Naval Audit Service
NAVAIR	Naval Air Systems Command
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command
NPV	Net present value
NSWC/Crane	Naval Surface Warfare Center, Crane Division
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget
ORDALT	Operational Requirements Document Alteration
Part #	Part Number
PBC	Performance Based Contracting
PBL	Performance Based Logistics
PD-21	Product Development for the 21^{st} Century, a Masters degree program developed at the Naval Postgraduate School, Monterey, CA

PEO	Program Executive Office
PM	Program Manager
PMO	Program Management Office
PPBS	Planning, Programming and Budgeting System, a financial suppot system
PR	Purchase recommendation
QDR	Quadrennial Defense Review
ROI	Return on Investment
SA	Systems Architecture
SEDI	Systems Engineering Development and Implementation Plan
SPAWAR	Space and Naval Warfare System Command
SSB	Sunset Supply Base
SSDS	The Ship Self Defense System developed for the Navy under the program management code PMS-461
STD DEV	Standard Deviation
SWOT	Strengths, Opportunities, Weaknesses and Threats. Analysis of the SSB System.
SYSCOM	Systems Command
Tech Refresh	Technology Refresh
TOC	Total Ownership Cost

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PMS 461
AN/AQS-20X COTS Working Group
PMS210
Sunset Supply Base Integrated Product Team – NSWC Corona
NSWC Crane – Code 60400

Original Equipment Manufacturers:

Aydin Corporation	Motorola Inc.
BARCO	Paralan
Bustronic CO.	Performance Technologies, Inc.
Computer Conversion Corp.	PESA Switching Systems
Condor Products Corp	Radstone Technology Corp
Datum-Bancomm	Ramix
DY 4	RDI
Elma Electronics, Inc.	Red Rock Technologies Inc.
Folsom	SBE, Inc.
FORCE Computers, Inc.	SBS GREENSPRING
Interphase Corp	Spectrum Control
Logic Technology Inc.	Universal Power Systems
Micro Memory	VisiCom a Titan Company
Mil-Power	

Sunset Suppliers
Basic Electronics
GD California

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DMEA	NSWC Corona
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GIDEP	NSWC Port Hueneme
Government/Industry COTS Working Group	NUWC Keyport

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EXECUTIVE SUMMARY

This thesis as the "Capstone" requirement for the PD-21 Masters program perpetuates the emphasis of the program in providing the appropriate tools necessary in development of a product – "taking a light bulb idea and making a real product that works for the intended purpose." This thesis represents a cross Systems Command (NAVSEA/NAVAIR) developed product. The product – the Sunset Supply Base system - encapsulated in the five parts of this thesis paper, provides a complete system for addressing the risks and supportability issues involved with Commercial Off the Shelf (COTS) products in Navy combat and support systems. In addressing the COTS challenges - Head-on - the information contained herein was implemented on three Navy combat weapon systems at various phases of the product development life cycle: AN/ASQ-20X Sonar Mine Detecting Set (E&MD transferring to production), SSDS MKI Ships Self Defense System (a legacy system), and SSDS MKII Ships Self Defense System (current production).

The thesis body and each of the four appendixes (A – D) are written as standalone documents addressing specific functional areas regarding the SSB system. The main body of the thesis describes the background, challenges, and issues that are addressed due to COTS products in Navy systems then presents extracted highlights from the four appendixes to illustrate the approach, systematic methodologies employed, and subsequent results yielded through the implementation of the SSB system. It also provides to the Program Management Offices (PMO), PMO support groups, and other decision makers a high level summary of performance expectations.

Appendix A – The Sunset Supply Base Architecture – identifies at a high level of abstraction a collaborative architecture to provide a roadmap for design and development of the SSB system, which will meet the Navy's needs. Appendix B – The Systems Engineering Development and Implementation (SEDI) plan for the SSB system – is a prescriptive or "How to" manual to enable implementation activities with processes, methods, tools, and practices that have been used to successfully implement the SSB system. The SEDI plan takes a Systems Engineering approach leveraging internal Navy

resources and the supporting COTS supply base then matches these resources to the PMO's needs and existing DoD infrastructure (i.e. PPBS, supply system, Fleet requirements). Appendix C – Business Case Analysis (BCA) – presents the data collected as a result of implementing the SSB system as described in the SEDI plan and communicates in tabular and graphical methods the information and knowledge gained. The BCA addresses the business and programmatic attributes showing the viability and value proposition possible through the SSB system. Appendix D – The Marketing Plan for the SSB system – identifies the internal, external, and customer environments and defines methods and practices necessary to establish the SSB system as the alternative of choice providing the Navy "best value" regarding the supportability of COTS products in the Fleet

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I. INTRODUCTION

A. BACKGROUND

Over the years the Department of Defense (DoD) has been plagued with development programs that have experienced significant cost overruns and schedules that have slid to the right all too often. In the end, the delivered weapon systems prove to be of little value due to the enormous delay of deploying them. The challenge to design, develop and implement processes to address these issues is an ongoing initiative. Making government more efficient has been a continuous theme for years now. In fact, as early as 1980 Congress passed the Paperwork Reduction Act in a step towards improving government performance. In 1993 the Government Performance and Results Act, which required government agencies to set strategic goals, measure performance, and report on the degree to which goals were met.[1) NIH] More recently, in 1996, Congress passed the Information Technology Management and Reform Act [2) Clinger-Cohen]. This act essentially required government agencies to improve the way they selected and managed Information Technology (IT) projects. Soon after, the Office of Management and Budget (OMB) established circular A-130, Management of Federal Information Resources. The purpose of this circular was to further establish a policy for managing Federal Information Resources.[3) OMB]. The result of the Clinger-Cohen Act and OMB Circular A-130 was the establishment of a comprehensive approach by individual federal agencies to improve the acquisition and management of their IT development efforts. Working within this new process, program offices began aligning their resources in support of their respective strategic missions. To be effective they began to implement investment management strategies that established control mechanisms that would align the appropriation of funds to their strategic mission. In effect, they improved the way they selected, planned and managed their development programs by restructuring the way they allocated their resources before any initial investment was made in a particular program. One of the ways these agencies achieved this was rethinking the selection process. Traditionally, priorities were given to their programs and decisions on which programs would be funded were made based on this prioritization. Under this new way

of thinking, the selection process was centered on a program's cost, benefit and risk assessments. These three elements would be quantified and analyzed prior to any release of funds. In essence, a Business Case Analysis (BCA) was performed as part of the selection process.

In an effort to provide "best-value" in acquiring new weapon systems or upgrading existing platforms, the DoD sought to establish specific guidance to the Program Management Offices (PMO) for reducing life cycle costs. One of these initiatives was the use of Commercial off the shelf (COTS) products and services. The COTS Initiative was brought about by the fact that the commercial sector essentially drives technology change at an extremely fast pace and that the DoD could take advantage of this while reducing life cycle costs. The COTS Initiative provided a potential path to infuse new technology into the military systems and at the same time avoid the developmental costs associated with grooming the new technology. The rate at which private industry can develop and deliver new technologies is orders of magnitudes faster than traditional DoD acquisitions.

The use of COTS products in military weapon systems is a reality. DoD 5000.2 and the Federal Acquisition Regulations (FAR) have both advocated the use of COTS products due to the potential benefits associated with leveraging big business capabilities. These capabilities include developing state-of-the-art technologies and delivering them in products that are produced in quantities that reduce cost. To this end, the COTS manufacturers' position in the marketplace, the company size and its technology edge, impact the direction and update cycles of technology and the products that employ them. Therefore, they hold a significant place in weapon system development and manufacturing because they can effectively facilitate the quick response to DoD changing needs. The net result to the DoD is a reduction in initial costs for COTS products as well as improved reliability and availability of the weapon system. However, since military weapon systems are typically unique, the use of COTS becomes a tricky business in terms of dictating system design and ultimately life cycle support. In terms of software, military applications tend to be very specific, and the weapon system cannot tolerate or support changes without adequate response time. Compatibility and configuration-

control become crucial elements for both software and hardware due to their interdependency. Support activities are pressured to maintain stabilized baselines in order to keep the certification of the system verifiable. These baselines include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e., installation of replacement parts, firmware, software or hardware revisions, etc…). Needless to say there are significant risks associated with COTS and therefore managing these risks is a crucial element for success. For weapon systems that do use COTS products some of the more identifiable risks are:

- Engineering changes, increased costs, and potential schedule delays due to poor supportability late in the development or after fielding the system.
- Life cycle costs estimates for COTS product usage is inaccurate due to poor logistical support analysis.
- Poor sustainability due to not considering supportability during the design phase.

[4) DAU]

Understanding these risks helps us to better define where the problem lies. With the problem description provided above, we can conclude that additional supportability solution alternatives are needed to address the shortcomings of the present COTS environment. A proactive position must be taken to include these alternatives in strategic supportability planning that will effectively mitigate the risks associated with COTS product usage in military weapon systems.

This document introduces and defines a support solution alternative that specifically addresses these shortcomings. This solution alternative is known as the Sunset Supply Base system.. The Sunset Supply Base (SSB) system is a unique alternative approach to extend the supportability of COTS products predicated on the needs of the Navy Programs. The extension of product availability, beyond the Original Equipment Manufacturer (OEM) assigned date to drop the products as obsolete items, provides stability to the system baseline configuration, during periods of time between scheduled Technical Refresh and Insertion. The uniqueness of the SSB system is evident through how it is structured. The OEMs are: a) market driven, b) high volume and high technology, c) their business plan is driven by their commercial customer base, with only

about 0.4 % of their business going to DoD and d) Experience fast update cycles (< 18 months). In contrast to these OEM attributes, DoD has: 1) Unique applications with lengthy life cycles (20-40 years), 2) requires a minimum technology refresh or update cycle of not less than 5 years, and 3) have operational readiness and maintainability support issue that span the entire life cycle. To bridge the gap between the OEM business planning and the Navy's need for long-term support, the OEM is given incentives to continue production and if necessary a third party is brought in. This third party is the Sunset Supplier. The Sunset Supplier makes a contractual relationship with the OEM to produce the obsolete products for the OEM customer base. The OEM transfers the intellectual property and assembly know-how to the Sunset Supplier and for this the OEM receives royalty on the sale of all products produced. Internal to the Navy are support infrastructures to ensure supportability of Sunset products by mitigating any component part obsolescence issues if they exist on those products. The infrastructure and support of the SSB process yields, not only, significant cost savings but also provides other benefits, such as: why don't the #'s start with 1?

1) Supportability of products defined by customer need, (5, 10, 15, 20 years)
2) Life Cycle Cost (LCC) savings, due to no life-time buy at the assembly level is needed, so the assemblies are procured as the customer require them.
3) Reparability of assemblies over the designated life cycle (5, 10, 15, 20 years)
4) Hardware/software/firmware stability between Technology Refresh (TR)/insertion cycles
5) Significant reduction in Program risk as related to COTS and life cycle management
6) Improved schedule flexibility and support options that can be tailored for Fleet needs
7) Minimal or no impact on system operational performance. The performance will remain constant through the use of exactly the same part: form, fit, and function replacement, which has been made by the alternate manufacturer, the Sunset Supplier.

B. PURPOSE

1. General

The focus of this document is to present and discuss the characteristics of the Sunset Supply Base system as it applies to the acquisition of military weapon and support

systems. By identifying the current status of economic and sustainment problems with COTS product usage, we can essentially offer and subsequently evaluate the Sunset Supply Base infrastructure as an alternative support solution to the obsolescence issues involving COTS products. To this end, this document offers a system-architecture, a process implementation plan, a business case analysis and finally a marketing plan, which collectively evaluates the feasibility, effectiveness, usefulness and challenges to and for DoD acceptance. Each is provided as a separate enclosure and can be used independently from the other enclosures for purposes tailored to specific reader needs. In reading any of the four deliverables, it is important to understand the purpose of the SSB process.

2. SSB Purpose

The overall purpose of the SSB is to provide dependable, cost effective supportability insurance for COTS based weapon and support systems. The result will provide a solution to COTS obsolescence issues, material shortages issues, and extend the supportability of COTS components. The architecture should address COTS technology obsolescence management through product and technology obsolescence forecasting methodologies and provide a new process for managing changes with COTS based systems. The final architecture should respond to the voice of the customer, who is demanding credible combat power through design and supportability, by putting speed and agility into the process, and ultimately provide some value as perceived by the customers. To be successful, the SSB process has defined specific goals and objectives derived from the present COTS product supportability inadequacies. Furthermore, this effort describes and discusses general DoD acquisition objectives and mandates. In the end we can effectively propose, execute and evaluate the SSB implementation against substantial and appropriate criteria.

Ultimately, the SSB architecture exists to respond to the demands of the warfighter. The warfighter requirements are communicated to the program office, and the PMO is tasked to develop and support systems that provide the expected combat power. As part of the Systems Engineering approach employed through the SSB system the program managers develop a support strategy that accommodates the warfighter requirements. The SSB architecture offers a support alternative that, when implemented

as part of the support strategy, adds speed and agility into the supportability process, ultimately providing value as perceived by the warfighter.

C. RESEARCH QUESTIONS

1. Area of Research

The purpose of this research is to define, document, pilot and implement a support system for Navy hardware that incorporates the use of Commercial Off The Shelf (COTS) products. This Thesis provides a set of transportable/transferable tools, methods, and processes and, when taken in whole, will represent a reusable product. Identified within the body or as appendices shall be four deliverables: Systems Architecture model, Systems Engineering Development and Implementation (SEDI)plan, Business Case Analysis (BCA), and Marketing Plan. The documents (i.e. deliverables) will be iteratively and recursively developed in parallel with the piloting of these concepts on three programs. The end result will represent a useable product, already tested and refined on three Navy programs.

2. Research Questions

1) What are the current COTS supportability methods, processes, and tools?
2) Are those supporting efforts effective in meeting the Navy's needs?
3) Can long term supportability of COTS be realized?
4) Does the Navy have current systems that can be leveraged to better support COTS?
5) What are the real, root causes of the COTS supportability issue, If there are any?
6) Can the COTS issues be addressed with minimal impact to other functions and systems?
7) Can a fiscally responsible solution be identified, measured, and tracked?
8) What resources, internal and external to the Navy will be required and at what price?
9) Is there a compelling business case for developing a long term COTS supportability solution? If one could be developed, how would it be sustained and verified?
10) If such a solution were developed what methods or means could be used to market it to the other potential users in the Navy or even external to the industry in general?

11) Is this solution in concert with Acquisition Reform (AR), the 5000 series documents, and other DoD and Navy initiatives?

12) What is the effect of this new resolution system having on Total Ownership Cost (TOC)?

13) Can the impact to the using community (i.e. customers) be reasonably estimated?

3. Discussion

The subject under consideration is an old initiative, which was ushered in at the beginning of Acquisition Reform (AR) and has affected nearly all procurements of military hardware. The initiative is the use of Commercial Off The Shelf /Non developmental Items (COTS/NDI) / products where possible in lieu of custom military unique products. One would expect that, after over 10 years of experience with living with this initiative and especially since it is deeply imbedded in policy, reviewing criteria, and procurement methodologies, that issues or unintended consequences as a result of the initiative would be resolved. However, with the long development cycles and time consuming implementation efforts regarding military systems, the effects of implementing the COTS/NDI initiative have finally started to show the "cause and effect" relationship between COTS/NDI and perturbations evident in fielded systems. The Defense Acquisition Deskbook (DAD) provides over 230 listings, as of April 2002, when searched on COTS/NDI covering such areas as: policy, planning, designing, fielding, costing, life cycle support, and many others. The new release of DoD 5000.2-R has tried to address some of the major problematic areas, thereby providing a few lessons learned. Specifically the areas of interoperability, testing & evaluation, and even a dedicated section, paragraph C5.2.3.5.7 "Commercial, Off-the-Shelf (COTS) Considerations", are incorporated to help guide the use of COTS/NDI. The issues now emerging which are effecting most fielded systems are described piece meal in this large volume of information and an attempt will be made to summarize, in the discussion below, some of the issues and their associated root causes.

a) *Market Driven Forces Versus DoDTtimelines*

The primary emphasis behind the push for the COTS/NDI initiative was the speed at which the market forces drove the latest technology. In fact the explosion of

new capability is described in a mathematically identified expression called Moore's Law. Moore's Law states that the speeds of computing power will double every eighteen months. It is this new capability, which causes the market place to move forward at such a furious pace, such that it causes the commercial product lines to cannibalize older less capable product lines, even if they are within the same company. The results of these forces provide new product generations to be developed and released every 18 months. In contrast, the development of military systems traditionally takes 10-15 years and these systems are then deployed and require support for as much as 30 years or more. Many of the systems once deployed are fielded with out-dated technologies that are very expensive to support. The COTS/NDI initiative provided a potential path to infuse new technology into the military systems and at the same time avoid the developmental costs associated with grooming the new technology. As a primary goal the initiative was envisioned to reduce the cost of development while increasing the speed of technology infusion into the military systems. However, increasing the speed of deployment of the newer technology into our military systems acts as a two edged sword. On the one hand, the latest technology may yield new capability at a lower development cost and allow continual upgrades to our military systems. On the other hand, the rate of change required to keep pace with these commercial markets (i.e., every 18 months) is incompatible with existing support and product development systems currently in place. Several DoD support systems are purposely constructed to take a conservative, thoughtful approach to implementing change and provide obstacles to the time elements necessary to keep pace with the commercial environment. What is most important with regard to these conservative approaches is the disconnect between the life cycle of the COTS/NDI products (approximately 1.5 – 5 years) and the typical reaction time for fielded equipment to be upgraded which is usually no less than 2 - 3 years in planning and additionally 5 – 7 years for implementation. This disconnect is further exacerbated when the fielded equipment is expected to perform over an extended life cycle possibly greater than 15 years. The specific systems which have been set up to provide methodical, time phased controls on the change process and which impact the implementation of the COTS/NDI initiative are summarized as follows:

PPBS

Planning, Programming, and Budgeting System (PPBS) – This system is intentionally conceived to provide fiscal and planning oversight. Consisting of a five step process: Planning, Programming, Budgeting, Enactment, and Execution; this process takes 2 years prior to the release of funds. Although the system may be short circuited by reprogramming of current funds, the process is not user friendly and may take an act of congress (to be taken in the literal sense) to receive authority to proceed. Experience has shown that following the PPBS process or reprogramming funds to meet obsolescence issues due to COTS/NDI products is a tough sell, especially since the new "wiz-bang" system although functional is not supportable or worse yet, obsolete before the design engineering is complete. Important to note is that once a COTS manufacturer has gone to the next generation of product, the previous product shall only be supported for a limited period of time, usually 1 –2 years. When the support period has passed the manufacturer abandons the earlier products – this means no design information is available, parts and repair methods are no longer available, and the testing programs and test sets are not retained. Therefore fielded hardware cannot be supported.

Repair & Support

DoD traditionally developed project management planning for programs that have been based on long term deployment of fielded systems were supported by various levels of depot maintenance activities and a slow to respond material support system. These program plans have not taken into account the fluid nature of the COTS environment; therefore the program gets "blind-sided" by unforeseen changes that need immediate attention to protect the supportability of fielded hardware. When dealing with systems maintenance the usual system of depots is inappropriate because the government never paid for the design or intellectual property rights and therefore does not know enough about the design or configuration to test or repair the COTS/NDI products. The second major issue is the lack of insight into the product development path taken by the commercial manufacturer. These manufacturers will react to their primary customers in industry and respond accordingly to the market forces regardless of what plans have been made by the small "niche" market (< .4% of the business base) of DoD. In the area of

maintainability/supportability DoD is at the mercy of the COTS manufacturer. However, the procurement of spares for system support is dependant on a limited time availability of products soon to become obsolete and require intense focus by our material support systems, this will require some level of pain to meet required deadlines.

Field Change Implementation

Controlling changes to a baseline, in the design cycle or for fielded hardware, is a convoluted, time-consuming process. In the case of a system currently in the design process it will require multiple design reviews, which could lead to further perturbation by involving oversight activities as identified in DoD 5000.2-R. In the case of fielded systems an ORDALT (Operational Requirements Document Alteration) needs to be prepared, tested, materials purchased, kits assembled, Fleet assets scheduled, visits requested then made, kits installed, tested, and finally integrated with the particular requirements of the specific hull involved. Typically an ORDALT for a system will require at a minimum 5 – 7 years to implement on combat weapon systems. If the change to the COTS product is provided as a “no impact” or “Drop-in” replacement (i.e., no change to form fit or function) the process followed is that which is required for a type 2 Engineering Change Proposal (ECP). This process truncates the test and evaluation process to a mere 30-step process, which based on experience, may take 6 – 12 months to complete.

b) *Interoperability and Configuration Control*

Interoperability through open systems architecture is still a dream, which has not been realized in our fielded systems. Our current fielded systems are closely coupled and rely in a great extent on the hardware characteristics of specific products. These characteristics must remain stable for the software intensive combat weapon systems to function and meet their certification requirements. One of the major flaws of the COTS/NDI initiative is the lack of control over the configuration of COTS products. The government is purchasing an off-the-shelf product but not the design, design disclosure nor the assurance of a configuration to be controlled to some pre-planned baseline. The manufacturer has no requirement to inform the government of any changes to the internal hardware or software (firmware) characteristics of their COTS products.

The manufacturer specification sheets only provide inputs and outputs in rather vague terms, which will satisfy the needs of their primary customers in industry. Although this point seems to be a minor issue to the commercial customers, with military combat weapon systems built on closely coupled software the result can, and many times is, catastrophic. A simple change of an internal chip using different firmware has required thousands of hours of software engineering to get a combat weapon system to function then many more test hours to re-certify the system for use. In defining the COTS/NDI policy an assumption was made that control over the configuration was either unnecessary or that our systems were robust enough to handle the perturbations of potential change, neither is true. Our currently fielded systems are very sensitive to small changes and the stability of the hardware is paramount in the continued supportability of those systems.

D. BENEFITS OF THE SSB SYSTEM

1. Objectives and Goals

a) *Expectations*

Understanding the needs of the customers we must now derive specific goals to meet those needs. These goals we must be related to our national defense strategy and acquisition policies. To align the customer needs with appropriate goals it is crucial to understand the necessity for effective collaboration between the warfighter, the program offices, and private industry to successfully meet the system requirements. To this end, we expect the architectural form of such a process will exhibit the characteristics of a collaborative system, which necessitates voluntary participation. Figure 1 - The COTS Collaborative Environment - depicts a conceptual illustration of such a collaborative system within the Navy for the Sunset Supply Base. This voluntary participation is needed for the assemblage and maintenance of such a system and is crucial to its success. Success will be measured continuously for those properties that emerge against how well they fulfill the purpose and how well they are managed to accomplish their specified tasks. Through abstraction we can visualize a system that has very distinct elements that work together for mutual gain and to satisfy a common need.

Therefore, we can expect that such a system should evolve from existing support structures, processes, and methods currently used in support of the Navy's systems.

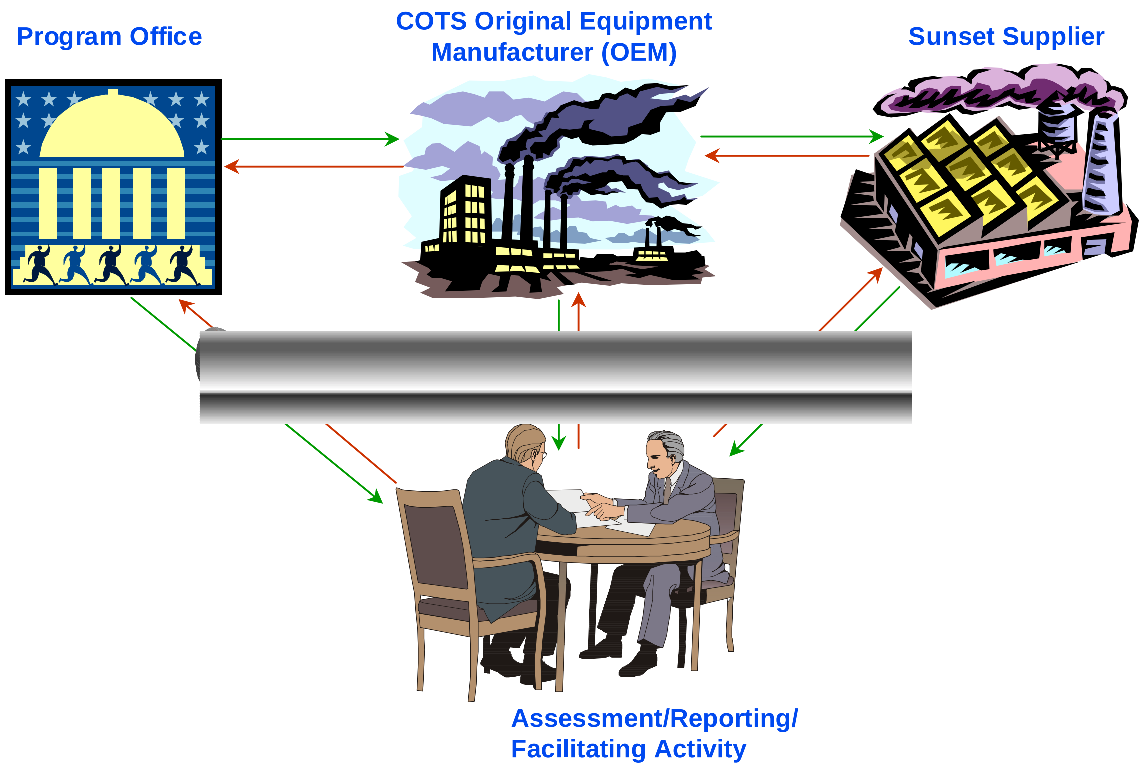

Figure 1: The COTS Collaborative Environment

b) *Sunset Supply Base Objectives*

The objectives of the SSB process provide the rational for deciding to implement the SSB infrastructure. By formally stating the overall objectives of this subject, we essentially establish a basis by which the analysis can assign values to specific benefits and ultimately guide this effort into making a reasonable conclusion statement and provide realistic recommendations. These objectives are categorized and discussed below.

Financial and Business Performance

The overall objective mandated by the current DoD Systems Acquisition Process (DoD 5000) is to improve performance, including quality, at lower costs. This process focuses on delivering advanced or at least current technology to the warfighter faster. PMOs are challenged to offer rapid acquisition of reliable and supportable technology while also reducing Total Ownership Costs (TOC) and improved

affordability. In meeting this challenge, we see a proliferation of interoperable systems using COTS products. Quite often the use of similar COTS across weapon systems that are separate and distinct which have no physical or logical dependence on each other share the same COTS items. The use of COTS in itself brings a certain risk of being able to support them long-term due to Diminishing Manufacturers Sources and Material Shortages (DMSMS) and obsolescence. The fact that many different programs or weapon systems are using the same COTS products, only increases the risk and threat to system sustainability across these programs. Therefore, the SSB process attacks these two areas, risk and costs, by providing a potential architectural solution that specifically addresses the issue of obsolescence and DMSMS problems, thereby reducing both risk and costs to the program. In answering the mail on this, the SSB process strives to compress the provisioning timeframes, by partnering with private industry and providing them with incentives (as previously mentioned) to assume some of the risk (i.e., immediate supportability and warranty) and costs (i.e., stockage, storage and issue of COTS spares and repair parts). Doing so, will have positive impacts in terms of supportability, program planning, program risk and TOC.

Strategic Position and Ownership

Partnering with the private sector to take advantage of commercial technology advances as well as the support and maintenance of COTS products are firmly established mechanisms used by the DoD/Navy. DoD determined a potential cost savings would be possible by pooling the expertise and capabilities found in private industry. Partnering takes on many forms (i.e. teaming, procurement/sales, work-share arrangements); but the important point here is that they exist and are being utilized more and more by the PMOs.[5) OSD] Furthermore, the Program Manager as part of the acquisition strategy must establish a support strategy. In fact, this plan must "address life-cycle sustainment and continuous improvement of product affordability, and supportability, while sustaining readiness."[6) OSD]. To this end, the Program Manager has at their disposal a set of tools to help in the decision-making process for determining the most cost effective alternative for supporting the system. The SSB architecture is challenged to position itself within this toolset as a viable alternative. A strategy for

positioning the SSB architecture within the supportability analysis repertoire would include establishment or improvement of strategic alliances. The SSB architecture has already been implemented on three Navy programs (SSDS MKI, SSDS MKII and AN/AQS-20/X Sonar Mine Detection Set). The relationships developed between the participating commercial entities and the Navy agencies should lobby the DoD Program Executive Offices (PEO) with sufficient detail as to the benefits of implementing the SSB architecture on the respective programs. Since the SSB architecture was built on existing expertise and functions within the Navy, the SSB process is in fact owned and therefore managed by the DoD/Navy. Additionally, the long-term relationships that will be realized through the SSB environment should further emphasis and influence the policy-making office within the DoD as to the potential gains, not only in the performance of supportability and sustainability functions, but in maintaining key technologies as well.

Operations and Functions

The objective here is simple – to improve program supportability by extending COTS reparability for 5 years and beyond. Why 5 years? Typically, the development of military systems has been 10 to 15 years, and the DoD/Navy have experienced approximately 5 to 7 year efforts for technology refresh or insertion. The reason for this is primarily due to the inherent nature of DoD to take a purposely conservative and thoughtful approach to implementing change. DoD has constructed very well-defined controls for managing the acquisition process, which have in effect created obstacles for keeping pace with commercial product development. This conservative approach has resulted in disconnect between the life cycle of COTS products and the typical reaction time of the DoD/Navy to field new equipment. The life cycle for COTS products are approximately 18 months to as much as 5 years (although rare), whereas the DoD typically takes 2 to 3 years in planning and an additional 5 to 7 years for implementation. The problem of supporting these weapon systems is further compounded when these weapon systems are expected to perform over an extended life cycle – possibly greater than 15 years. Given this situation, the SSB process has identified as an objective to support the product development cycle and ultimately the system life cycle. For weapon systems that have deployed COTS, the SSB architecture

offers an opportunity for supporting existing technologies. Success in these areas will fulfill the SSB architecture's commitment to improving operations and functions for the PMO since they are the entity who are responsible to manage the program over its lifetime.

Product and Services

In terms of product and service, the SSB architecture offers a truly unique and effective process for improving customer satisfaction. The customer in this case is the warfighter who use and maintain the system. The PMO must ensure that they deliver key enabling technologies that must also be supportable for fixed periods of time. The SSB architecture offers an additional alternative for the PMO to consider as part of their support strategy. Furthermore, the SSB process allows the program manager to match the COTS update cycles with the program's technical roadmap or refresh effort. The product is essentially a set of well-defined tools that provide obsolescence indicators and reports, as well as the ability to mitigate maintenance and supportability issues at the assembly level. Establishing and managing this information, the PMO becomes empowered with the knowledge necessary to deliver an improved customer service. In the long run the system integrity is maintained, which has several implications in terms of integrated logistical support (i.e., training, manuals, configuration control.)

Image

This is an unusual area since we are not talking about the image of a specific entity like an agency or company. The objective here is to promote the idea of the SSB architecture as a viable, effective and valuable alternative based on costs and benefits. At first glance, it may appear to some that the SSB process is trying to hold onto older technology. Old, meaning technology associated with COTS products that have been discontinued. The fact of the matter is that the DoD/Navy has not been able to keep up with commercial product update cycles. In a perfect world, it would be great to be able to transfer commercial state-of-the-art technology to the warfighter the moment it was deemed ready or at least when it emerges in the market. But the acquisition process institutionalized by the DoD offers too many obstacles to achieve this. Although Acquisition Reform has yielded great gains in streamlining the acquisition process, it is

still purposely conservative, deliberate and methodical, which translates to slow when compared to the current commercial development cycles. Although DoD pressures the PMOs toward COTS products for the reasons discussed earlier, it does not adequately define all aspects of supporting them. The military acquisition community is pushed by DoD 5000 to use COTS products as the preferred alternative for use in its weapon systems, whereby the obsolescence issues are slowly getting worse. So even though the use of COTS products is growing, the PMOs continually struggle with DMSMS issues, which is why they routinely fund and support DMSMS activities to meet the Navy's ever increasing need. The SSB system is designed to specifically address these risks, but more importantly, it is expected to work with existing support systems as an interfacing method to optimize solutions in managing the obsolescence risk on COTS products. Furthermore, not only does the SSB system offer significant supportability and cost benefits to the Program Offices, it also strives to be recognized as a contributor in Navy/Industry cooperation, a major initiative underway particularly in the Navy. A major objective of this effort is to establish the SSB system as a unique standard practice while projecting its image as an enabler of currently used support systems, that are employed during the decision-making processes regarding supportability of COTS products. The results derived from implementation on three Navy programs demonstrates how the SSB system is a collaborative system in which the participants voluntarily use the system and in return receive value added products and outputs.

c) *SSB Specific Goals*

The systems architecture shall have the following goals:

To be able to identify, quantify, and mitigate supportability risk to programs.

This process must be affordable and be able to successfully assess the cost savings attributed to the process. The information derived from identification and mitigation of supportability risk shall be quantifiable and readily accessible by participants.

Extend the life cycle and supportability of COTS.

Supportability of fielded hardware shall be defined by the warfighter. The process shall take this into account as it defines the metrics for assuring late-life cycle supply source. To be successful the DoD shall continue to leverage commercial developments with appropriate economies of scale in order to reach expected military performance goals and still offset the problem of diminishing material.

Provide infrastructure to support existing platform/combat systems in support of the Program Office.

This goal is to provide an infrastructure earlier in the development process to demonstrate and prove COTS components and to support existing weapon systems. This will provide significant reduction in program risk as related to COTS and life cycle management.

Achieve significant and quantifiable cost savings over the product life cycle.

Cost structures shall be tracked and continually assessed over the entire product life cycle. This will significantly impact the effectiveness of informed decision-making that is needed for success. The up front cost assessments will contribute to the life cycle cost savings, due to NO *lifetime buys* at the assembly level. The assemblies would be procured, as the customer requires them.

A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).

The process shall have definable and repeatable characteristics in order to provide a comprehensive and flexible solution to supporting fielded hardware. It shall provide an independent utility (an alternative option for DMSMS/Obsolescence Management) for programs when implementing COTS products and whose solutions will have minimal or no impact on system operational performance.

Institutionalize methods for proactive management of COTS including DMSMS issues.

The institutionalization of these methods will require the development of non-standard Integrated Logistics Support (ILS) and contract strategies and implementation methodologies that will access the commercial support base. In doing

this, the process must be sensitive to proprietary design rights and provide a forum for appropriate negotiations. The methods employed shall improve product supportability problem detection and provide sufficient time for appropriate decision-making processes to implement analysis for alternatives and solutions. Overall it shall provide aid to the decision-maker by providing technology assessment and management guidance at various levels - piece parts, lowest replaceable units, units, subsystems and multiple platforms.

A system that leverages Navy and commercial supportability assets and provides a networked solution.

The process must take advantage of inherently governmental functions for DMSMS Management at the various field activities and coordinate with the commercial supportability assets. This coordination must be embraced through a thoroughly meshed and maintainable communication network.

Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation.

The process must be transportable in terms of its applicability to various DoD entities and their contract strategies. Aggressive integration of common components across DoD entities should lead to flexible integrated logistical support of COTS products and should provide incentive for the commercial industry to develop long-term relationships.

Forecast budget requirements in support of the programs/war fighter/consumer.

The process shall provide predictive information for the decision-making components of the DoD program offices. In forecasting budget requirements in support of programs/warfighter/customer the outputs from trade-offs and assessments must achieve a high level of confidence with the program office.

Improve schedule flexibility and support options of system upgrades or new development initiatives.

The process should incorporate improved schedule flexibility and support options that can be tailored for the warfighter and the support activities needs. One of the

main objectives shall be the compression of provisioning timeframes. To this end, increased responsibility on the contractor's part is assumed in terms of stockage, storage and issue of COTS spares and repair parts. The benefits that we will strive to achieve shall include immediate supportability, elimination of government levels of inventory stock, employ large commercial distribution systems, no source inspection, commercial packaging, fast and direct delivery to the warfighter, and warranty of components.

E. SCOPE AND METHODOLOGY

1. Scope

The scope of this thesis is broken down into essentially four deliverables:

a) *System Architecture*

The overall purpose is to provide dependable, cost effective supportability insurance for COTS based weapon systems. The result will provide a solution to COTS obsolescence issues, material shortages issues, and extend the supportability of COTS components. The architecture should address COTS technology obsolescence management through product and technology obsolescence forecasting methodologies and provide a new process for managing changes with COTS based systems. The final architecture should respond to the voice of the customer, who is demanding credible combat power through design and supportability, by putting speed and agility into the process, and ultimately provide some value as perceived by the customers

b) *System Engineering Development and Implementation (SEDI) Plan*

The purpose of this plan is to put into perspective the processes, methods and tool needed to implement the Sunset Supply Base (SSB) system. This document is presented as a "stand-alone" prescriptive set of actions, which can be taken in the establishment of an SSB system. However, this document does not portend that it is the only process or method to establish such a system but instead is the method the authors had chosen to implement the SSB system. The document is constructed in three major sections, which follow a brief introduction to the SSB system concept. The primary issues grappled with in the SEDI plan are those faced during implementation and encountered primarily when bringing the idea into reality. The first section of the plan

address introduction to the program and the infrastructure needed to support the effort, such areas as: teaming structure, computer resources, communication methods, interface with the Programs, data structure requirements, management participation, etc. The second section of the plan covers the implementation of the SSB system and, in turn, presents many challenges to overcome in realizing the SSB system. Examples of some of these challenges include: identification of the COTS Original Equipment Manufacturers (OEM), interface methods with the OEMs, interface with the Program, understanding the Programs needs and requirements, building relationships between the OEMs and the Navy, identifying suitable partnerships between the OEMs and small build-to-print suppliers where applicable. The final section of the plan identifies methods and metrics to measure the impact of implementing a SSB system, thereby providing adequate indicators for the programs to assess the effectiveness and value proposition in using the system.

c) ***Business Case Analysis (BCA)***

The Business Case Analysis focuses on the Sunset Supply Base system for supporting Navy hardware that incorporates the use of Commercial Off The Shelf (COTS) products. It is offered as a tool that supports planning and decision-making for SSB implementation. The Business Case Analysis (BCA) was performed for the Ship Self-Defense System (SSDS) MKI but can be applied to any acquisition program. The BCA addresses the financial and non-financial consequences of implementing the SSB on the SSDS MKI program. Not only does it show the funding profiles for various scenarios of support it also includes the methods and rationale that were used for quantifying benefits and results. The baseline constraints of this case is a time period of ten-years which gives us a framework for providing decision-makers key information for developing program strategies and execution tactics for reducing cost, improving supportability requirements and reducing risk.

d) ***Marketing Plan***

This Marketing Plan is one of the four foundational documents created to establish the SSB system as a Commercial off the Shelf (COTS) supportability alternative for Navy fielded systems containing COTS products. The plan analyzes the

environments (external, internal, customer) in which the marketing functions will be operating. The SSB system is evaluated for its attributes, both positives and negatives through a "SWOT" (Strengths, Weaknesses, Opportunities, Threats) analysis. Each of these characteristics is then matched to a marketing strategy to improve the system's marketability. Two goals are set: A) capture 20% of market share (72 Navy programs or 80 man-yr per year effort), B) Establish an image for the SSB system as the alternative of choice for COTS supportability that enables cost effective technology insertion in fielded Navy systems. Based on a defined "Target Market", a "Marketing Mix" is defined that identifies a series of marketing action to take to achieve a competitive advantage for the SSB system in maximizing market penetration. This Marketing Plan is an integral part of overall System Engineering approach used to develop the SSB system whereby the implementation of the Marketing Plan is contained within the system implementation process.

2. Methodology

The methodology is focused on the previously described four deliverables in and effort to exhaustively address the main problem described within this document of supporting COTS product usage within military weapon and support systems. In doing so, the method takes a four-step approach that is aligned with each deliverable.

STEP 1. Create an architecture that can affordably and effectively mitigate program supportability risk.

The methodology used during the development of the System Architecture for the SSB system required review and evaluation of various attributes which contribute to the supportability or lack of supportability of the COTS products in Navy systems. The first area reviewed dealt with defining the current issues with the COTS products as perceived by the Fleet, the PMOs, the program support teams, the OEM suppliers, the Fleet support activities, and internal Navy support infrastructures. To accomplish this task an exhaustive literature search was done and combined with the results from interviews with each group affected. These efforts identified several problems and systemic issues that needed to be addressed in the architecture. The next area, which needed to be evaluated was the structure and dynamics of the current support systems, identifying how these

system met the unique characteristics presented through the use of COTS products. With this evaluation in hand, a gap analysis was done to pinpoint shortcomings in current support strategies and practices. An environmental analysis both pre-and-post Acquisition Reform (AR) was accomplished to identify potential causes and candidate resolutions. The pre AR environment was characterized by a rules-based, hierarchical, requirements rich environment defined through the use of military specifications, this yielded a risk adverse posture. The post AR environment was characterized by a performance based environment which resulted in a requirements poor environment that necessitated a risk management posture. The pre-and-post AR environments provided the backdrop and context in which to interpret the feedback we received from the different entities interviewed. The architectural form chosen was a collaborative architecture and was formulated through the evaluations and analysis identified above and is documented in Appendix A – Systems Architecture for the SSB system . Development of the architecture followed the sequential steps listed below, which defines major attributes/characteristics of the architecture.

- Need
- Purpose
- Goals – Expectations, Objectives, & Specific Goals
- Collaborative Concept
- Function & Form – Overarching System, SSB Standalone System, Interface Management
- Timing
- User Environment

STEP 2. Implement the architecture.

The second step is the actual setup and execution of the SSB architecture. Implementation occurred on the SSDS MKI & MKII Systems and the AN/AQS-20/X Sonar Mine Detection Set. Implementation was accomplished with specific expectations. First, in order to effectively assess the overall value and feasibility, measurable goals which was established under the architectural design of the SSB system would be used as evaluation criteria. Furthermore, the implementation would provide crucial financial data to be analyzed as quantifiable measures. The information derived from this step is

categorized into financial and non-financial. The financial information would support the Business Case Analysis (BCA) whereas the non-financial would provide lessons learned. The experiences of implementation are to be recorded and presented as guidance within a formalized Systems Engineering Development and Implementation Plan. Actual implementation would also yield both benefits and shortcomings that help significantly to improve the system during the evolutionary process, the expected development path for our collaborative system. In short, this step provides two key elements that contribute to this effort:

8) Lessons learned and valued experienced that supports the establishment of a Systems Engineering Development and Implementation Plan, which is offered as guidance for future SSB architecture implementations.
9) Specific, quantifiable data collected for evaluation and analysis conducted under the Business Case Analysis.

STEP 3: Conduct a Business Case Analysis.

In this step we conduct a business case analysis of the actual SSB implementation on the Ship Self-Defense System MKI. This system was chosen as a case study because it provided the most data and experience in terms of the SSB process. The outcome of this step is a document that essentially:

1) Organizes data collected in the previous step.
2) Converts the data into useable and pertinent information.
3) Analyzes the results.
4) Derives knowledge from the results.
5) Makes appropriate recommendations.

In following this general 5-step process, the final document serves as a tool that supports the planning and decision-making with respect to implementing the Sunset Supply Base system. Of course, it could not be expected that the SSB system would be the solution for all Navy programs nor is it intended to replace traditional support practices, but this step intends to show how the SSB architecture's true value is realized when its implementation is in conjunction with current processes. In fact, the acceptance of the SSB system only provides the program manager with additional cost effective solution scenarios in terms of weapon system support, maintainability and operational

readiness. This document focuses on the SSB as a viable solution alternative for the Navy Program Offices to consider in their decision-making efforts with respect to optimizing return-on-investment (ROI). The phrase return-on-investment is not necessarily used in the strict sense here, but rather alludes to the challenge of reducing life-cycle costs while maintaining adequate support levels and system baseline stability over predefined periods of time. However, since ROI is in effect a measure of a company's performance, it is appropriate in this case since the task of the Program Offices is to get the "most bang for the buck", which is in essence a measure of their performance. The analysis presented within the BCA considers several financial metrics and how they relate to the value of this business case in the selection process. The Business Case Analysis (BCA) will detail the likely financial results and business consequences of implementing the SSB system so that the proposed benefits and risks are succinctly documented and understood.

The BCA looks at the implementation of the SSB system on the Ship Self-Defense System (SSDS) Mk1. It considers the consequences of implementing the SSB infrastructure for providing COTS support for the SSDS program. These consequences include both tangible and intangible results, and are analyzed for conformance to DoD policy, program requirements and overall cost/benefit. Furthermore, it looks at how well the actual implementation relates to the goals and objectives of the SSB. In short, the business case examines the likely costs and benefits that will result in implementing the SSB system for supporting the SSDS program. In considering SSB implementation the analysis reports on four scenarios:

1) Traditional support practices.
2) Full SSB implementation in which all COTS components are support via Sunset Supply Base infrastructure.
3) Partial SSB, where only those COTS components are supported in which the OEM and/or Sunset Supplier have agreed to enter into a contractual relationship.
4) Modified SSB implementation, where the use of the SSB system is only used where it makes sense. The SSDS COTS Working Group, which is responsible for overall execution and management of the SSB system for a particular program, makes these decisions.

STEP 4: Development of a Marketing Plan

In this step a Marketing Plan was established that promotes the SSB system as a Commercial off the Shelf (COTS) supportability alternative for Navy fielded systems containing COTS products. This document defines the marketing strategy and boundaries for gaining DoD recognition and acceptance as a "value added" support solution alternative. In essence, the Marketing Plan brings together the details of the previous steps and relates them to the environment and community to which the SSB system will exist. The environmental and community aspects are researched and documented in terms of the external (private) and internal (organic) environments, expected competition, policy and legal constraints, and forecasts or estimates. The Marketing Plan then identifies and lists the SSB system's strengths, weaknesses , opportunities and threats – commonly referred to as a SWOT Analysis. The SWOT Analysis is an effective mechanism for focusing available energy in terms of SSB system acceptance into areas or programs that are believed to be where the SSB system can be most effective. Also, this analysis helps in divulging the greatest opportunities for future SSB implementations. In addition, this analysis helps to uncover and identifies potential problems, puts these problems into perspective, and establishes what important tasks have to be performed to overcome these problems. The Marketing Plan is neither an independent or stand alone process/method, instead it is embedded as an integral part of the SSB system itself such that a marketing customer focus is maintained throughout all aspects of the approach. Therefore in order to understand the marketing implementation efforts, knowledge of the SSB systems implementation or SEDI plan is necessary.

Each step of the methodology is encapsulated and delivered as a stand-alone document (Appendices A-D) that specifically addresses the SSB system from four interrelated perspectives. The System Architecture defines the problem and proposes a well thought out holistic solution alternative that establishes clearly define objectives and goals. The Systems Engineering Development and Implementation (SEDI) Plan effectively puts the SSB System into practice. Implementation and execution of the SSB process is then assessed with respect to the established goals, objectives and expectations offered in the System Architecture plan. This implementation helps to collect valuable

data to support continuous evolution of the SSB process as well as developing a BCA and Marketing Plan. The BCA converts the data into information for analysis and reports on the results leading to knowledge that directly supports and enhances the decision-making process. Additionally, the BCA offers recommendations and/or feedback for SSB system improvement. Finally, the Marketing Plan feeds off of the SSB implementation (lessons learned and overall experiences) and the BCA results, as well as environmental study, and develops a strategy that provides guidance for future SSB implementation opportunities.

II. LITERATURE REVIEW

A. PROBLEM STATEMENT

Acquisition Reform and the policies that it invoked brought about the implementation of COTS. Those policies required the avoidance of unique requirements, restrictive statements of need, and detailed specifications. Together with DoD 5000.2 and the Federal Acquisition Regulations (FAR), DoD hoped to leverage the large businesses in terms of state-of-the-art technologies and quantity of manufacturing in order to provide state-of-the-art technology at lower costs. COTS technologies are driven by the market forces of that industry, and the COTS manufacturers are driven by their customer base of which DoD only makes up approximately 0.4%.[7) Hartshorn] To hold a place in their market, COTS manufacturers must remain competitive, which means a continual push in the development and use of technology. It is this intense competition that drives the fast technical update cycles and ultimately influences technology change and direction. To this end, the COTS manufacturer's position in the marketplace is dependent on: the company size and its technology edge. These factors impact the direction and update cycles of technology and the products that employ them. Therefore, the COTS manufacturers hold a significant place in weapon system development and manufacturing because they can effectively facilitate the quick response to DoD changing needs.

Typically DoD design and develop cycles span 5 to 7 years (10-15 years historically) [8) McDermott] and are expensive and often deploy out of date equipment. COTS manufacturers on the other hand take a big business approach in offsetting development costs through economies of scale and volume rate productions. Therefore, they can effectively implement technology change in a more timely manner. Through the Acquisition Reform Initiatives, DoD is encouraged to capitalize on these big business characteristics and allow industry to be burdened with the technology development costs. The expected result for DoD is lower overall developmental investments and an opportunity to be able to synchronize their design efforts with state-of-the-art technologies.

The widespread use of COTS in military weapon systems does however bring certain challenges. Nothing is as easy as it looks. There are serious obsolescence issues associated with the use of COTS, as well has other material shortages issue. The challenge is to provide life cycle support of fielded systems that use COTS products as part of the systems critical components. The life cycle for some military weapon systems may exceed 20 or 30 years. This is not at all consistent with big business timelines, and there is presently no incentive for COTS manufacturers to continue production of DoD COTS products on a small scale. The driving force here is the market driven rate of technology change in the commercial world. In the commercial world technology updates occur over an 18-month to 2 year cycle.[8) McDermott, 9) Glum, 10) Robinson] By contrast, the DoD experiences technology refresh cycles between 5 and 7 years.[8) McDermott] This cycle is impacted not only by software and hardware updates but by programmatic schedule changes as well. The challenge is further exacerbated by how the military will continue to develop weapon systems that do not fall prey to technology that will not last or technology that will undergo significant change.

Technology changes will occur in the COTS arena and will have direct impacts on military weapon systems existing and even those under development. Slight changes in software could have devastating effects. Quite often systems are built around software, which means systems architectures are dictated by software and slight software changes will likely have significant cost impacts. Relatively small software changes could have very expensive consequences. To expound on the implication of software change impacts, we need to understand that software may not only dictate certain standards, but that software changes occur fairly regularly in the commercial world and re-integration is difficult and expensive. The DoD has to be aware of the impacts to hardware due to software changes. Likewise, slight changes in COTS hardware may impact software applications. Additionally, there could likely be impacts in terms of interfaces with other equipment or systems that may not be so apparent. Subtle specification changes to COTS hardware (i.e. timing, execution…) could have devastating ripple effects. These negative effects will be at the system level and will substantially increase the risks associated with using COTS in the future.

Since military weapon systems are typically unique, the use of COTS becomes a tricky business in terms of dictating system design and ultimately life cycle support. In terms of software, military applications tend to be very specific, and the weapon system cannot tolerate or support changes. Compatibility and configuration-control become crucial elements for both software and hardware. Support activities are pressured to maintain stabilized baselines in order to keep the certification of the system verifiable. These baselines include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc..)

To fully understand this issue of support, we must revisit certain DoD characteristics. Military acquisition is characterized by high development costs and very long development cycles; therefore military procurements are forced to project future needs and purchase as many products or components as they think they will need. Furthermore, in light of unique military applications, the lengthy life cycles and the 5 to 7 year technology refresh rate, DoD realizes that they presently have no control over product evolution, and therefore must compensate by staying aware of pending changes. This awareness is critical if the military is to expect any appreciable success in support of their weapon systems. Operational and maintainability support is expected over the entire life cycle of the system. This includes support for design and development efforts as well. As mentioned previously, DoD design and development cycles spanning 10 to 15 years, are expensive and often deploy out of date equipment. These design and development activities must rely on commercial products to be available when the design goes into production. Furthermore, production and manufacturing facilities must rely on the source of supply in producing the systems they were contracted for, which will include commercial products that contain their own supportability issues.

The impacts of ineffectiveness to support our weapon systems throughout their life cycle will be realized in military readiness and capability. When we consider the huge investments that DoD makes in getting technology to the warfighter and training our warfighter, support of our weapon systems should not be the weak link in maintaining high levels of combat readiness and personnel safety. This weak link might

be the result of the ever-increasing pressure to reduce costs. Very often we hear of cost as the independent variable in design and development efforts and that total ownership costs should be factored into the design process. To do this the design activities must maintain a holistic perspective of the system to include life cycle support of technologies that have been selected for insertion into their weapon systems.[11) Osmundson] With the challenge of reducing costs and effectively supporting the warfighter, today's systems architects for DoD systems must understand what drives cost in order to carefully consider alternatives for life cycle support.

The cost associated with supporting weapon systems throughout their life cycle is perhaps most sensitive to the availability of components that are needed to maintain stability in the operational context. As legacy systems age, their associated support and maintenance costs rise dramatically due to obsolescence, reliability and supportability problems while at the same time the performance of the system decreases. As original equipment manufacturers synchronize their product lines with technology, products presently deployed in DoD weapon systems, as well as products intended for use in developmental systems, will be affected. Alternate components or parts will need to be considered for acceptance or rejection. There will be material shortages occurring because of the social, economic, and political environments. In either case there will be costs associated with these decisions and cost must be managed effectively. If the alternate part is accepted, an engineering change proposal will need to be initiated. There is cost associated with preparation, coordination, scheduling and testing of the alternate part. If the alternate part is unacceptable, large product buys will be needed to ensure operational integrity and support of the system over its life cycle. There is cost with developing a new source of supply. In these cases there are issues of where to buy, how much to buy, where to stock them, and how to manage the costs and logistical support to meet the needs of the customer.

Understanding costs will help government activities meet the needs and desires of the customer, mainly in assuring life cycle support of COTS products. More specifically, we need to extend the supportability of COTS since we know that the life cycle of many weapon systems exceed the life expectancy of the COTS used. By addressing the

supportability issue we effectively address a much deeper need, that is warfighter readiness and capability. By assuring COTS supportability through the system's life cycle we can consequently ensure reasonable combat readiness and capability status. In essence we need to provide stability in terms of baseline configuration of the weapon systems that use COTS in order to support the periods of time between technology refresh cycles. That is to say there is a compelling need to improve the supportability of fielded products for the period necessary to meet the user requirements. In satisfying this need, the stabilizing solution/alternative must be cost effective at the initial procurement, over the life cycle of the system, and ultimately provide the lowest possible impact to Total Ownership Cost (TOC.) The solution space will necessitate a predictable and sustainable process for support of fielded and developmental systems. To be successful, this process will need to adequately identify risk, mitigate those risks, and provide resolution methods and planning. Knowing now that a new architecture is needed to meet these needs we must conclude that a departure from traditional methods is necessary to meet the challenge of sound planning and careful tailoring of COTS acquisition at the lowest possible cost.

Reduced government funding and manpower levels have further emphasized the need to improve life cycle management processes. Perhaps the focal point for this effort is COTS risk mitigation during development and for fielded weapon systems. This type of continual assessment is needed to offset the fast technology update cycle experienced in the commercial realm. Continual systems assessment will provide system baseline configuration stability and supportability. Key to success is the need to continually assess Original Equipment Manufacturers (OEM) and their COTS products. This assessment should provide valuable insight to the vendor's stability, which in turn impacts the level of risk associated with specific products employed by DoD. Such assessments would perhaps look at how limited a vendor's product line is and/or make judgments on the potential of specific products in that line to change or disappear. To this end, it becomes important to determine the likelihood that a vendor will continue to provide DoD assets and the consistency of that product line. The challenge is in the

architecting of a process that is proactive, disciplined and systematic, that will consider and address the needs of the customer.

The **customer** in this case takes on many dimensions.

The End User - Certainly the end user must be considered for it is the end user we depend on to operate our weapon systems and provide the expected defense as defined in our national strategic policies.

The Program Management Offices (PMO) - This includes the initial acquisition community whose purpose is the acquisition of new systems. They also support the in-service engineering activities that must continue to procure parts as part of an alteration kit or on-going support for the warfighter, including repair and replacements of parts. The PMOs support the Integrated Logistical Support (ILS) functions, which must plan the long-term support of fielded equipment including changes to the equipment baseline. One of the PMO's primary responsibilities is budgetary support for personnel who must project the availability of products that extend over the 2-year Program Objective Memorandum (POM) cycle and the 3-5 year implementation cycle. Additionally the PMOs must provide funding in support of field activities or service contractors who prepare Cost, Health, and Risk models, which quantify the availability and supportability of the fielded systems.

Interoperability Support Activities - These activities must obtain and maintain a stabilized baseline in order to keep the certification of the system verifiable. These support activities include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc.).

Design and Development Activities - These activities must rely on commercial products to be available when the design goes into production.

Production/Manufacturing Facilities - These facilities must rely on the source of supply of component piece parts needed for producing the systems they were contracted for, which will include commercial products that contain supportability issues.

B. ECONOMIC PROBLEM

The current DoD requirements include a scenario of increased operations while at the same time a continuous push for weapon system upgrades. The easy solution would be to increase the defense budget, although not very likely. Given the political pressures of today, DoD PMOs are challenged to search for more economical alternatives. The challenge, in effect, is to maintain near-term weapon system readiness while at the same time planning for weapon system modernization efforts. To add to this, DoD is undergoing a serious reduction in government infrastructure. Given the current trend of increasing military operating tempos, the struggle to accomplish any sort of modernization effort is going to be difficult. In fact, financial resources are likely to be used to maintain these levels of operations rather than conducting serious modernization efforts. The Joint Aviation Logistics Board (JALB) June 1999 report on *Commercial Support of Aviation Systems* states that "…discretionary procurement accounts dropped by 53 percent since 1990, while operations and maintenance activity declined by only 15 percent" [12) JALB]. The implication of this statement is that replacement or upgrades to existing systems are effectively being delayed. Secretary of Defense William Cohen, in the May 1997 *Report of the Quadrennial Defense Revie*w, observed that " Today, the Department is witnessing a gradual aging of the force." [13) QDR] This lends credence to the statement in a 1994 issue of *Army RD&A Bulleti*n: "In actuality, our military hardware is now on a replacement cycle of about 54 years - this in a world where technology typically has a half-life from 2 to 10 years." [14) Augustine] The end result to all of this is that, existing systems will have to be maintained at the required levels of availability and reliability for extended periods of time. Therefore, traditional support strategies will have to be re-evaluated to address this phenomenon. These traditional strategies typically expect total government ownership of support material and total government control over design changes. What this has leaded to is known as the COTS initiative. The emphasis on COTS product usage was brought on by the fact that the DoD could conceivably take advantage of technology developments in the commercial sector at a reduced cost to development programs. So given the fact that more and more of the defense budget is going to sustainment of operations, the financial resources needed to

modernize existing weapon systems is decreasing. So to reiterate, support of existing fielded systems at a reduced financial burden is needed and one initiative meant to meet this challenge is the use of COTS products throughout DoD weapon and support systems. With COTS products come additional challenges in support, given the fast paced technology update cycles in the commercial sector as compared to the slow and methodical DoD acquisition process. Thus, there is an anticipated increase in material or product obsolescence. So the savings realized by implementing an aggressive COTS initiative could be offset by obsolescence and the need to redesign. This is not to say that COTS products have not proved beneficial, on the contrary, but the overall process for incorporation and sustainment of COTS products continues to evolve and program managers continue to be confronted with certain challenges associated with this. Therefore, a solution alternative is needed to counteract the costs associated with the redesign of weapon and support systems due to obsolescence rather than performance.

C. SUSTAINMENT PROBLEM

The COTS initiative was brought about by the fact that the commercial sector essentially drives technology change at an extremely fast paced and that the DoD could take advantage of this while reducing life cycle costs. The COTS initiative provided a potential path to infuse new technology into the military systems and at the same time avoid the developmental costs associated with grooming the new technology. The rate at which private industry can develop and deliver new technologies is orders of magnitudes faster than traditional DoD acquisitions. Take a look at computing power, which has appeared to double every eighteen months. The same phenomenon has occurred across the spectrum of technology at different rates. Market forces other than the DoD essentially drive this explosion of new capabilities. DoD makes up approximately 0.4% of the market share; [7) Hartshorn] therefore; it's not hard to see how commercial product lines are driven by the private sector vice the DoD. There are two fundamental reasons for this fast pace. One is the ever-increasing demand for new capabilities primarily in the private domain. Second, the competitive drive to get technology to market first and gain the most lucrative share of the market. In either case, DoD has little influence. Original Equipment Manufacturers (OEM) routinely stop production on items that can no longer

be justified from a business perspective regardless of the impact to the DoD. The typical length of time a product can be considered available is approximately 18 months. That is to say, manufacturers are developing and releasing new capabilities every 18 months to 2 years. In contrast, DoD weapon system acquisitions typically take 10 to 15 years to develop and fully deploy. At a very minimum, DoD can presently only hope to achieve technology-refresh cycles of 5 years, which is still not adequately aligned with commercial product updates. See Figure 2 for a pictorial representation of this phenomenon.

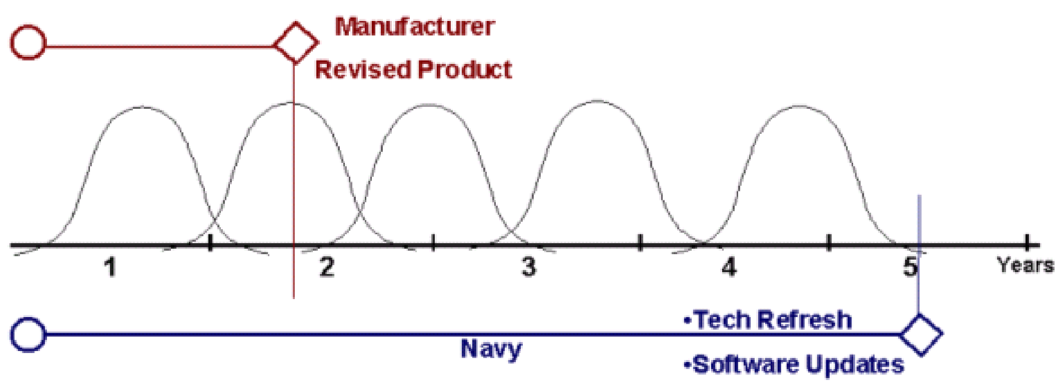

Figure 2: COTS vs NAVY Refresh Cycles

When we say fully deploy, we mean that even though a weapon system is ready to be installed, each platform for installation must be scheduled to receive it. Even if we consider an aggressive development effort within the Navy, the time to develop a new or enhanced capability could easily take 5 to 7 years. Once the weapon system has been tested and deemed ready for deployment, it will take additional 5 to 10 years to fully deploy. Every platform or ship that is to receive this weapon system must be scheduled and the work to install performed. Ship deployment schedules and the length of availabilities (in-port period when the work is performed) add serious delays to installing the weapon system. It is simply inconceivable to think that new technology, which is turning over every 18 months, can be infused consistently throughout the Fleet. Of course, its possible to have different platforms upgraded to different levels of capability, but then we run the risk of incompatibility between platforms and a logistical nightmare in supporting various versions of the same weapon system. What this all comes down to,

in terms of COTS, is a decrease in DoD control over weapon system design and subsequent support. The purpose here is not to discredit the COTS Initiative as ineffective. The COTS Initiative in conjunction with a well throughout open systems approach, will contribute greatly to DoD's effort to bring the latest technology and capability to the warfighter at the most cost effective levels and be able to sustain such affordably. The fact of the matter is that, the DoD acquisition process is purposely constructed to take a conservative, thoughtful approach to implementing change, thereby introducing obstacles to the time elements necessary to keep pace with the commercial environment. The most important point to understand here is the disconnect between the life cycle of commercial products (1.5 to 5 years) and the typical reaction time of the DoD for modernizing fielded weapon systems. Traditionally, the support strategy has been to buy spares and store them based on a forecasted need over this period of time. In reaction to the obsolescence announcement, the Program Office enters a planning period of between 2 and 3 years. Following this is a 5 to 7 year expectation for actual implementation. So we are looking at approximately 7 to 10 years between system upgrades or replacement at a minimum. But now consider the fact that these systems are expected to be in service for 15 years or more and the supportability issues become apparent given the consistent 18-month to 2-year commercial technology life expectancy. In essence, when the DoD decides to use COTS products, they become obsolete during the planning phase. Even a well-planned approach can push COTS technology insertion into the implementation phase only to become obsolete during this period as well. This instability to systems' design baselines is a major issue for maintaining appropriate readiness and availability. Understanding the realities associated with implementing and supporting COTS products, an effort must be made to deal with stabilizing the systems' design baselines so high performance in terms of support can be achieved.

D. COTS PROBLEM

The term COTS, Commercial-Off-The-Shelf, refers to the entire range of products and services procured by the DoD. Nearly every weapon system and their basic repair items use commercial items to varying degrees. Today, it is not a matter of all or nothing, but how much of the system is COTS based. Figure 3 is a notional interpretation

of COTS as described in the Federal Acquisition Regulation (FAR), Subpart 2.1, Definitions Section 2.101.

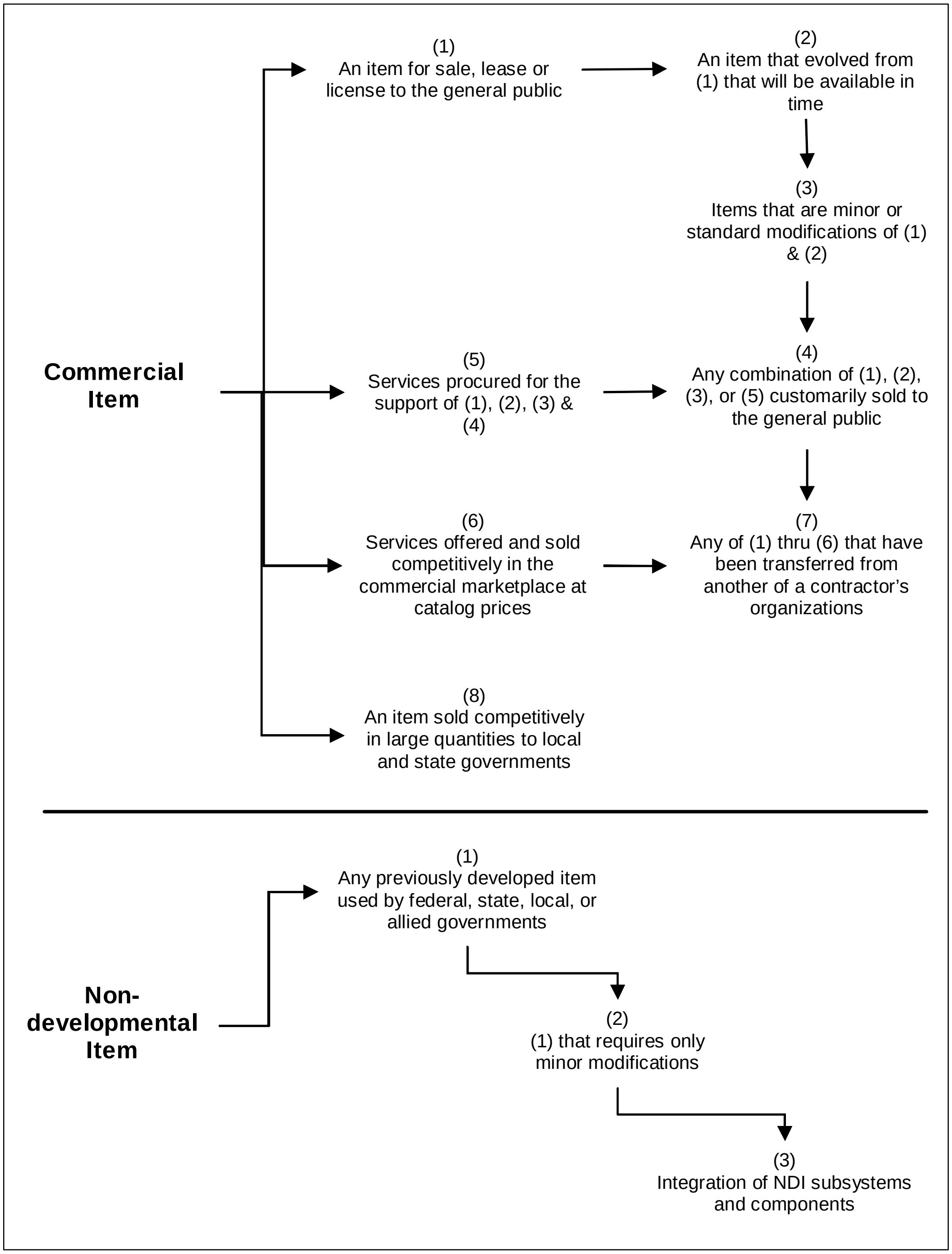

Figure 3: COTS Description [15) FAR]

The DoD mandate for COTS product use is driven by two important situations. First, that fact the commercial market leads the DoD in latest technology development;

therefore, in order for the DoD to access state-of-the-art technology they must come to the commercial sector. In the past the DoD lead the way in research, development and application of technology for military weapon systems. Today private industry leads the DoD in these areas. Secondly, the present industrial base is very stable. That is in the face of obsolescence, DoD suppliers struggle to stay in business due to reduced procurement by the DoD. The larger companies have sufficient market share to remain stable through these periods of reduced DoD procurement. Additionally, they can respond to a surge in requirements by the DoD.

Given the widespread use of COTS products in military weapon and support systems, certain challenges have become evident in terms of ensuring long-term supportability. The challenges stem from serious obsolescence issues and material shortages. The challenge, in essence, is to provide life cycle support to fielded weapon systems that use COTS products. Consider for a moment that many systems will have life cycles that exceed 20 or 30 years, and one can easily imagine the sustainment nightmare involved. The slow acquisition process, the long life expectancies and traditional support methods are not consistent with commercial business practices. In fact, there is little incentive for COTS manufacturers to continue to produce items in rather small quantities just for the sake of ensuring some system performance baselines. If DoD chose not to use COTS, there would be little impact to the commercial world. However, given the proliferation of COTS products throughout military weapon systems, when a product is no longer produced the impacts to the DoD are profound and severe. Even small changes to a product can have serious repercussions to weapon system performance and design baselines. The fact of the matter is, there will be technology changes within the COTS arena and they will have direct impacts on military weapon systems, both fielded and under development. Slight changes in COTS hardware could possibly impact interfaces with other equipment or systems that may not be so obvious. Subtle specification changes to COTS hardware (i.e., timing, execution…) could have devastating ripple effects. Furthermore, changes to hardware could, and often do, require changes in software code in the larger system. A change in code translates into time and money. Time to make the necessary changes, test the changes, and deploy the changes

and money to perform these tasks. This is not hard to understand, when you realize that many systems are built around software (that is architectures that are dictated by software). Software is a key enabler to achieving open systems architecture, as software is assumed easier to update than hardware. Nevertheless, slight changes in software do have a cost associated with it and the impacts could be significant. In the face of the rapid updates to software in the commercial domain, DoD re-integration efforts can be difficult and expensive. To this end, the continue implementation of COTS products in the development of military weapon systems will lead to a situation where these systems will constantly fall prey to technology that will not last or forever changing.

E. THE CONTRACTING ENVIRONMENT

The DoD 5000 series documents require the contracting environment to maximize competition and considers it critical in providing innovation, product quality, affordability and reducing costs from both government and industry providers alike. Through the use of the systems engineering approach, an integrated acquisition and logistic process must focus on Total Ownership Cost (TOC) or the subordinate Life Cycle Cost (LCC); Identifying supportability as a key design and performance factors. The OMB Circular A-76 requires through policy statements, the use of competition to enhance quality, economy, and productivity. These enhancements are possible by performing cost comparisons of commercial activities performed by the government, with contracted commercial activities from either within the government or from industry. Circular A-76 is not designed to simply contract out. Rather, it is designed to: (1) balance the interests of the parties to make or buy cost comparison, (2) provide a level playing field between public and private offerors to a competition, and (3) encourage competition and choice in the management and performance of commercial activities.

The foundation documents, such as OMB Circular A-11 and A-76, were put in place to establish the performance based contracting methodology, identify this cost focus as the primary discriminating criteria. Conversely the guidance documents put in place by Naval Inventory Control Point (NAVICP) which are used to implement the methods, go beyond the cost criteria by adding additional caveats and restrictions, such as an “all or nothing” involvement, for functionally different but related portions of the

support effort. Furthermore by dictating the allocation of certain functions to be accomplished by specific entities, the guidance documents constrain the cost focus of the foundational documents potentially yielding to sub-optimal results. The NAVICP implementation documents define three baseline assumptions which mold the contracting environment: 1) awards a contract to a single supplier, 2) assess current in-house government activities/functions on past performance only, and 3) defines a government employee and/or activity as sub-contracting to a contractor. The singular contract requirement cannot be implemented within the Organic activities due to built-in constraints defined by the Navy's structure. In identifying this as a pivotal requirement the implementation documents define a non-competitive environment with respect to the Organic activities. The second implemented baseline assumption provides bias when performing cost comparisons. Central to the decision making process regarding the potential use of a Performance Based Logistics (PBL) contract is the development of the Business Case Analysis (BCA). The ground rules currently used in developing the baseline cost estimates for Organic support (i.e. in-house Navy support activity) uses historical performance data and compares this data with contractor proposed estimates in evaluating cost effectiveness of the contractor's proposed cost. Important to notice is that the Organic support costs rely solely on the past data and by doing the analysis in this manner three major assumptions are made: 1) the past performance data is accurate, applied in an appropriate manner, and the data reflects current and future performance of the Organic activities/functions, 2) there are no opportunities to reduce, streamline, or improve the Organic cost figures, and 3) the Organic activities/functions would not be affected by the competitive environment. Applying historical costs to the Organic entities and comparing the cost estimates in a proposal from the contractor yields a bias in favor of the contractor. Although this type of analysis is considered to foster a competitive environment where the lowest cost gets the contract, the process side steps many of the tenets of true competition. The third baseline assumption appears to be in direct conflict with the foundational documents for functions/activities, which require the use of value judgments having long-term programmatic impacts. The implementation methods employed in developing performance based contracts handicaps the Organic activity/function, identifies no method to input into the decision-making criteria,

potentially places Government employees in a position of having a "conflict of interest", provides a "non level playing field", and in no way assures the Navy receives the best possible value available in today's market place.

The new emphasis in the contracting environment using PBL contracting methodologies presents challenges to the Organic activity/functions with respect to implementing the SSB system. It appears evident that these challenges include: 1) a barrier to entry into the PBL contracting environment due to exclusionary policies at the contract implementation level (NAVICP level) although the upper level policies support the SSB systems concepts, 2) the current contracting methodologies establish scenarios in which there could be a "conflict of interest" for Government employees when providing sub-contracting services for a contractor, this potential could directly impact the SSB system applicable since it is performed by Organic activities/functions, and 3) no definition/designation is provided with regards to the DMSMS support function and its categorization as an "inherently Governmental function" or a commercial activity, without such an identification there exists an amount of uncertainty about who would be performing the SSB systems functions in the future. The purpose of this section is to identify and describe the factors, which could influence the success of the SSB system in the current market place. Responses, adjustments, and/or resolution to the challenges described above are addressed in the Marketing Plan.

F. CURRENT STAKEHOLDER ASSESSMENT

Program Management Office (PMO) - The PMO through its Integrated Logistics Support (ILS) group orders COTS assemblies through the normal support systems by contract, purchase order, or Navy supply system. If an OEM no longer supports a product, then the PMO must look for another avenue to solve the issue, typically an engineering analysis and review is necessary yielding a variety of solutions most of which are very expensive. If the PMO is lucky or just well informed (which is not always the case), the OEM will provide a notice stating an "End Of Life" (EOL) date after which the OEM will no longer support the specific COTS product. At this point the Program Office must make some choices. Regardless of the choices made, the Program Office incurs a significant amount of risk usually at a hefty price.

Original Equipment Manufacturer (OEM) -The OEM is usually a leading edge technology/design firm that is market driven and produces at high volume and cost reflective of commercial economies of scale. The fast paced environment requires short-lived products (~18-24 months) to keep up with the ever-changing technology. The business case is just not there to cater to the DoD/government's needs and although the OEM wishes to keep this group of consumers, the momentum of the business cycle keeps the OEM focused elsewhere. Under these circumstances supportability is limited to production run time (~18-24 months) with approximately a 12-month follow-on repair and test capability period.

Small Business (SSB Supplier) - The SSB supplier is envisioned to come from the large base of smaller suppliers who, over the past three decades, have provided the DoD/government with high technology custom products. Using this supplier base will reduce the risk caused during the technology transfer process because of the proven track record earned when dealing with other DoD/government products. However, this will be a collaborative process and the final decision will reside with and between the OEM and the SSB supplier. Here the OEM holds the trump card and must be willing to live with the choice. The small business SSB supplier typically has extensive technical know how in the manufacturing area but lacks the expertise to accomplish proactive, predictive obsolescence management. These companies are customer focused, agile, and seek long-term relationships with their customers.

DoD Navy Activities/Resources - Most, if not all, of the needed functions required by the SSB system are already accomplished by internal DoD/government resources; however they are done in an ad-hoc fashion without the collaborative environment, and with no defined, supportable, and repeatable process in place. The expertise has always been available in the DoD/government but in a different form using a different process. Prior to Acquisition Reform, the MIL-Specs and Standards provided a requirements-rich environment with well-defined processes for implementation. These processes and implementation methods required the same expertise needed today but applied in a different context. Today's environment is requirements-poor, and the talented expertise must adjust to this performance-based versus MIL-Spec-based environment. The context

in today's environment is relationship-based, not rule-base, and the survivability of this entire group of talented experts will depend on their adaptability to today's context. Acquisition Reform removed the barriers put in place by the MIL-Spec, rule-based environment, but it failed to provide an adequate substitute, which would provide a robust process that can meet the supportability requirements and needs of the end user.

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III. RESEARCH METHODOLOGY

A. INTRODUCTION

The research methodology taken to develop the SSB system required the design and development of four independent documents coupled with implementation activities to exercise the concepts being incorporated into the system infrastructure. The four documents (Appendixes A-D to this thesis paper) are as follows:

- Appendix A – The Sunset Supply Base Architecture
- Appendix B – The Systems Engineering Development and Implementation (SEDI) Plan
- Appendix C – The Business Case Analysis (BCA)
- Appendix D – The Marketing Plan

Each of the four appendixes are written as standalone documents for use as independent ready reference materials for a specific area of interest. The purpose of this segmentation of the systems development was to provide a meaningful resource to the functional groups, who will need the background information regarding the SSB system, in an encapsulated set of characteristics germane to a specific area. For example, the SSB Systems Architecture will be of interest to PMO support groups like Integrated Logistics Support (ILS) groups, who will be interested in the relationship management areas between the OEM, the Sunset Supplier, procurement activities, and Navy support activities. The Systems Architecture provides an outline of these relationships and the reasons/logic behind their development. The SSB Architecture provides the initial structural elements and base relationships needed in development of the SSB system. The SEDI plan provides the "How, Why, When, Where, What" involved with the SSB system implementation process with the additional insight provided in the form of "Lessons Learned". The BCA presents a roadmap to assess the SSB implementation efforts and uses actual data from a Navy program to illustrate the utility of the analysis method and the expected outcome from the SSB implementation process. The Marketing Plan describes strengths and weaknesses of the SSB system and provides useful graphical and tabular information to help examine the usability of the system to a current or

candidate program. The SSB Systems Architecture and the SEDI Plan constitute the primary research methodologies used to develop the SSB system. The BCA and the Marketing Plan were developed as part of the analysis task of the SSB system and as such are covered in detail in the "Data Analysis" portion of this thesis paper. However to assure complete coverage of the research methodologies employed a detailed description of the Systems Architecture and the SEDI Plan are provided below.

B. APPROACH SUMMARY

The development of the four documents parallels the sequential path that was followed in the SSB system development process. The research methodology used in the SSB system development can be described at a very high level as:

- Identifying current status regarding COTS supportability, defining up-stream and down stream system requirements, capturing customer needs/expectations, performing a gap analysis current status versus customer needs, then defining a Systems Architecture (Appendix A) to encompass the identified expectations and constraints.

The output products of the Systems Architecture (SA) generation were then taken and implemented on three Navy programs. Since the SA provided a roadmap on what needed to be accomplished but lacked the details on how to get the system functional, the implementation step proved invaluable in addressing these concerns. The Systems Engineering Development and Implementation (SEDI) Plan (Appendix B) uses the "Functional Flow Diagram"- Figure 4 – and the "Informational/Data Flow Support Structure" – Figure 5, as the primary outputs of the SA effort. These output products were refined in the SEDI plan and renamed as the "17 Step Process" and the "Obsolescence Impact & Purchase Request Report" respectively. The SEDI plan identifies four primary implementation products and four major output products. The implementation products provide insight to the implementing process as a risk management tool while the output products provide decision quality information for identifying the "best value" alternatives for the Navy.

The data collected during the SEDI step, needed to be transformed into usable information and knowledge, this task was accomplished through development of the Business Case Analysis (BCA) (Appendix C). As a primary input the BCA used the

"Assembly Master & Cost Matrices" output from the SEDI plan, which provided the raw data for analysis. This raw data was embellished with resource modeling data provided by NSWC Crane's "Cost Model." The BCA in turn produced a series of tabular and graphical representations of the financial impact due to the SSB system implementation. An additional evaluation was performed describing non-financial impacts showing some of the emergent properties and opportunities produced through the SSB system.

Once the development roadmap, the implementing processes and products had been defined, the next logical step was to incorporate these elements of the SSB system in a package that could be easily disseminated through out the Navy's using community. The Marketing Plan (Appendix D) evaluates the characteristics of the SSB system in term of its strengths, weaknesses, opportunities, and threats, then provides a plan of action to capitalize on these attributes to provide "best value" to the Navy. The SSB system represents a Systems Engineering approach to solving the COTS supportability risks and as such defines an overarching system instead of limited point solutions. One of the major products produces in the Marketing plan is a graphical depiction, which compares COTS supportability point solutions to the attributes available through the SSB system. The point solution approach is currently the standard practice used by the PMO DMSMS support groups.

C. APPROACH DETAILS FOR THE SYSTEMS ARCHITECTURE AND SEDI PLAN DEVELOPMENT

1. The SSB Systems Architecture (SA)

The approach taken to develop the SSB System Architecture (SA) required a series of detailed evaluations to yield an understanding of the current environment and employed methods to address the COTS supportability issues. The premise for this developmental effort was the expectation that the end result would be an immediately usable product/system for the Navy. Therefore the developed system must work with and leverage as much as possible, the processes and practices used currently to support the Navy's systems. Detailed analysis is provided in Appendix A regarding the current status of COTS supportability for the Navy's system and their "cause and effect" relationship to the warfighter. The approach used to distill these independent support practices/methods

into a cohesive system required the use of some engineering judgments and the use of a set of well-established heuristics (base rules). A list of the primary judgments/heuristics [11) Osmundson, 16) Maier-Richtin] used to guide the development process, are as follows:

- Employ a holistic view.
- A complex system will develop and evolve within an overall architecture much more rapidly if there are stable intermediate forms.
- Using an evolutionary approach from current practices/methods as a baseline a spiral development process will assure the developed system answers the right problem.
- The greatest dangers are at the interfaces.
- Interoperable "Systems of Systems" will yield new and emergent properties which are greater than the sum of the independent systems.
- Design the structure with good bones.
- Consider a collaborative system a franchise. Always ask why the franchisees choose to join, and choose to remain.
- The system is collaborative in the sense that the members are assembled and operate through the voluntary choices of the participants, not through the dictates of an individual client.
- If the politics do not fly, the hardware never will.
- The emergent capability is the whole point of the system; but the architect may only be able to influence the interfaces among the nearly independent parts, the components are outside the scope and control of an architect of the whole.
- Members (Navy activities) participating in a collaborative system must understand that their efforts are not based on a "zero sum end game" that the gain of capabilities by one activity by using the collaborative system does not subtract capability from any other activity. The new emergent properties of the system provide a "Win-Win" scenario.

a) *Primary Output Products of the Systems Architecture*

The two primary output products from the Systems Architecture are provided below as - the "Functional Flow Diagram"- Figure 4 – and the "Informational/ Data Flow Support Structure" – Figure 5. The "Functional Flow Diagram" provides a high level sequential set of steps to follow in establishment of the SSB system. The "Informational/Data Flow Support Structure" shows the necessary information flow and

associated relationships needed to support the SSB system once in place. At the core of this collaborative approach is the management of interfaces. The planned development of the standalone SSB system from the overarching system, comprised of existing key entities, constitutes a collaborative architecture. Because the function and form of these existing entities is already defined and all operate as independent systems, interfaces between these entities become critical for effective collaboration. Thus, interface management is an important discipline that must be implemented in order for the SSB system to be successful. A means of effective interfacing is also crucial to the success of this system. Therefore following the graphical representations (Figures 4 & 5) a textual description of current practices/methods and proposed practices/methods is provided from the different participants viewpoints. These products provide the starting point and baseline from which the implementation efforts may begin.

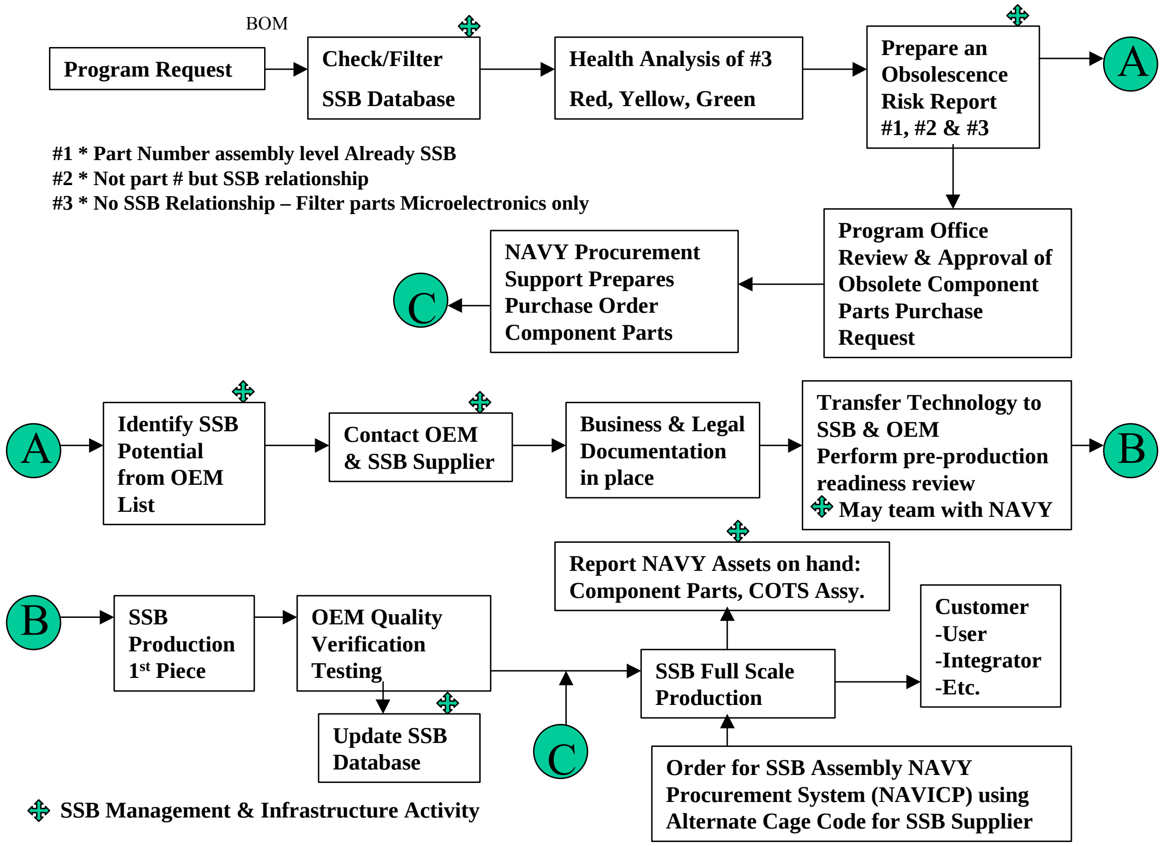

Figure 4: Functional Flow Diagram

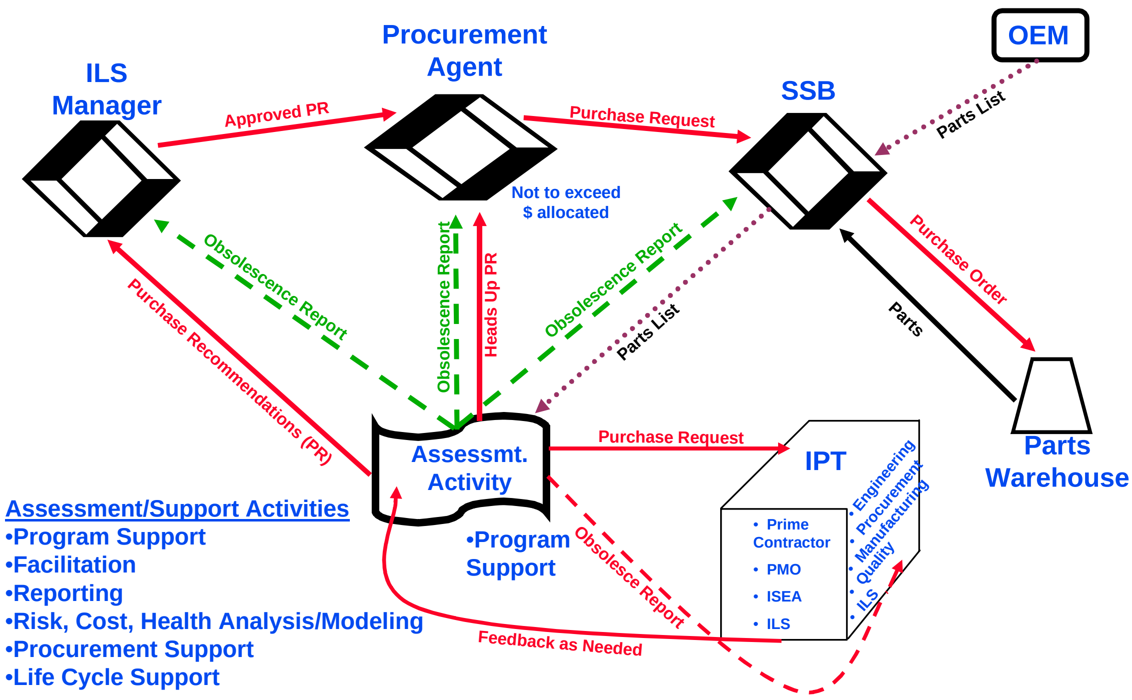

Figure 5: Information/Data Flow Support Structure

2. Impacts of SSB Implementation

Program Management Office (PMO)

Current: The PMO through its Integrated Logistics Support (ILS) group orders COTS assemblies through the normal support systems by contract, purchase order, or Navy supply system. If an OEM no longer supports a product, then the PMO must look for another avenue to solve the issue, typically an engineering analysis and review is necessary yielding a variety of solutions most of which are very expensive. If the PMO is lucky or just well informed (which is not always the case), the OEM will provide a notice stating an "End Of Life" (EOL) date after which the OEM will no longer support the specific COTS product. At this point the Program Office must make some choices. Regardless of the choices made, the PMO incurs a significant amount of risk usually at a hefty price.

Proposed: The collaborative process is illustrated using two notional graphic Figures (4 & 5) to show the relationship and informational interfaces between the PMO and the other identified players. Figure 4 shows the process flow at a functional level delineating the relationship each player has to the others during the SSB development.

As a collaborator in this process, the Program Office provides the funding resources to internal government activities to facilitate, assess, and report. Also, the PMO is agreeing to pay for the royalty and provide the Bill Of Material (BOM). For their efforts the PMO receives: 1) an alternate long term supplier of the COTS product and a relationship with that supplier and their associated OEM that may be extended for other OEM discontinued items, 2) as identified in Figure 5, a continuous update to the risk identification and mitigation efforts, proactively adjudicating obsolescence issues seamlessly on behalf of the PMO, 3) provides the PMO with a corporate knowledge data base on which future decisions can leverage, 4) although not identified through the figures, the program gains reparability and testability attributes over the life cycle of the system defined by the Navy's needs. The method of communication being online is nearly in real time so the effort expended by the PMO is minimal. Product ordering is done using current procurement methodologies.

Original Equipment Manufacturer (OEM)

Current: The OEM is usually a leading edge technology/design firm that is market driven and produces at high volume and cost reflective of commercial economies of scale. The fast paced environment requires short-lived products (~18-24 months) to keep up with the ever-changing technology. The business case is just not there to cater to the DoD/government's needs and although the OEM wishes to keep this group of consumers, the momentum of the business cycle keeps the OEM focused elsewhere. Under these circumstances supportability is limited to production run time (~18-24 months) with approximately a 12-month follow-on repair and test capability period.

Proposed: The OEM for their part in the collaboration effort has a lot to gain and little to lose. There is a business case to be made for making a profit from their intellectual property they no longer find useful. The 5-15% royalty is the incentive, but other non-tangible benefits enhance the business aspects in favor of the collaboration effort. Protection of their proprietary design is an inherent part of the SSB process through "Non-Disclosure Agreements (NDA)" and contractual mechanisms. Important to note is that the contractual arrangements are made with another company, the SSB supplier, not the government, which many OEMs find favorable since governmental red

tape would poison the business case. This situation leaves the ownership and control of the commercial products in the hands of the industry. Additionally, the government does not have to pay for the design only the product, a tenet of Acquisition Reform. By participation in the collaborative system the OEM establishes a long-term relationship with the DoD/government without the ongoing supportability issues. In turn these new emergent properties of the system can be used to enhance the ability of the OEM to market enhanced product supportability, not only to the DoD/government environment, but also any entity, which is configuration constrained due to the business constraints (i.e. refineries, paper mills, electrical power generation and control applications, etc.). The OEM efforts are concentrated during the establishment of the SSB supplier and play a crucial part in assuring that the OEM reputation will be in safe hands when the SSB supplier delivers products. The OEM however does agree to allow the internal Navy resources visibility into the products design by letting the SSB supplier share the parts list complete with associated component vendor information along with a top level assembly drawing. This is information the government has not been privy to in the past but it is essential for accomplishment of risk analysis and yielding the desired emergent properties of the system.

SSB Supplier

Current: The SSB supplier is envisioned to come from the large base of smaller suppliers who, over the past three decades, have provided the DoD/government with high tech. custom products. Using this supplier base will reduce the risk caused during the technology transfer process because of the proven track record earned when dealing with other DoD/government products. However, this will be a collaborative process and the final decision will reside with and between the OEM and the SSB supplier. Here the OEM holds the trump card and must be willing to live with the choice. The small business SSB supplier typically has extensive technical know how in the manufacturing area but lacks the expertise to accomplish proactive, predictive obsolescence management. These companies are customer focused, agile, and seek long-term relationships with their customers.

Proposed: As for their part in the collaboration process, the SSB supplier must be willing to be contractually bound by the agreement with the OEM and at the same time be willing to work the internal government resources to coordinate and facilitate supportability efforts while reducing risk to the program. Actions required by the SSB supplier will include:

- sharing the OEM parts list and drawings,
- be the purchaser, stock handler, and storage facility for parts that have gone obsolete and are awaiting consumption once an assembly order is placed,
- as requested by the program, be willing to stock all up assemblies (which have already been paid for) to enable immediate turnaround times of fielded assemblies which have failed,
- accept all the responsibility for being the prime supplier of the subject assembly.

In return for its efforts the SSB supplier is rewarded through:

- a new relationship with a pre-eminent commercial firm,
- a new product line,
- new customers, DoD/government and non-government,
- long term relationships with the new customers which enables long term business planning,
- technical partnering with internal DoD/government resources not only for predictive obsolescence management but a whole host of other specialties.

Internal DoD/Government Resource:

Current: Most, if not all, of the functions identified in Figure 4 are already accomplished by internal DoD/government resources; however they are done in an ad-hoc fashion without the collaborative environment, and with no defined, supportable, and repeatable process in place. The expertise has always been available in the DoD/government but in a different form using a different process. Prior to Acquisition Reform, the MIL-Specs and Standards provided a requirements-rich environment with well-defined processes for implementation. These processes and implementation methods required the same expertise needed today but applied in a different context. Today's environment is requirements-poor, and the talented expertise must adjust to this performance-based versus MIL-Spec-based environment. The context in today's

environment is relationship-based, not rule-base, and the survivability of this entire group of talented experts will depend on their adaptability to today's context. Acquisition Reform removed the barriers put in place by the MIL-Spec, rule-based environment, but it failed to provide an adequate substitute, which would provide a robust process that can meet the supportability requirements and needs of the end user.

Proposed: The internal DoD/government resources have a very crucial role to play regarding the supportability of all our systems from design to fielded systems. Supportability is an inherently governmental function for several reasons: 1) the motivation of our internal resources is in support of the end user needs; this perpetuates and enhances our positions and esteem, 2) due to the overarching scope and the long term broad based characteristics of supportability issues, no one prime contractor could, without conflict of interest, accomplish these functions, and 3) No entity has or even wishes to obtain the corporate knowledge maintained by our internal resource pool. The collaborative environment as is evident in Figures 4 & 5 imbeds the talented expertise into the SSB process in a way, which leverages these resources and creates a value stream for the program. The relationship building characteristics of our internal resources is very evident in Figure 5 where this crucial resource takes "center stage" in enabling the collaborative system. Taking both figures (4 & 5) in concert it is easy to see how the resource can gain program equity and support by reducing Total Ownership Cost (TOC), extend supportability of systems, and reducing program risk.

3. The Systems Engineering Development and Implementation (SEDI) Plan

The SEDI plan is structured in three sections: Infrastructure, Implementation, and Measuring & Assessing. The approach is intentionally focused on supporting the person(s) actually performing the implementation function. Insight into the process is provided by specific examples called "Implementation Experience" and embellished by "Lessons Learned" to help enable the implementing process. The tools, methods, and processes described are illustrated through actual examples where these practices were used to implement the SSB system on three Navy programs. These tools, methods, and processes are provided in detail in the enclosures so that they may be used, not only for

guidance but also for a reusable template for future work. A graphical depiction of the implementation process is provided in Figure 6 – Implementation Process – and was put into practice to generate the implementation and output products of the SEDI plan. Description of these products, are shown below and are used as the input raw data to the Business Case Analysis (BCA) and Marketing Plan.

The SSB system comprises several processes during the implementation of the concept. As identified in Figure 6 "Implementation Process", a relationship building process is established to obtain the COTS component information from the Original Equipment Manufacturer (OEM) for analysis. Arrangements are made at this time to involve a third party to continue manufacturing the products if the OEM chooses not to continue making the products. However if the OEM wishes to participate by continuation of production of the COTS products and share the risk of stockpiling obsolete parts, then the dashed box in Figure 6 identifies the scope of their participation. The component information is then analyzed for obsolescence risk and an assessment is provided to the DMSMS support team to determine the appropriate action plan. Typically the number of high risk parts are defined along with an estimated quantity of each part needed to support the program fielded equipment for a prescribed period of time, usually until the next tech refresh/insertion. These parts are then stocked on the OEM or third parties shelves until they are consumed to make the COTS assemblies needed in the Fleet. Dependent on the programs needs this process provides long-term support for the end user, the Fleet.

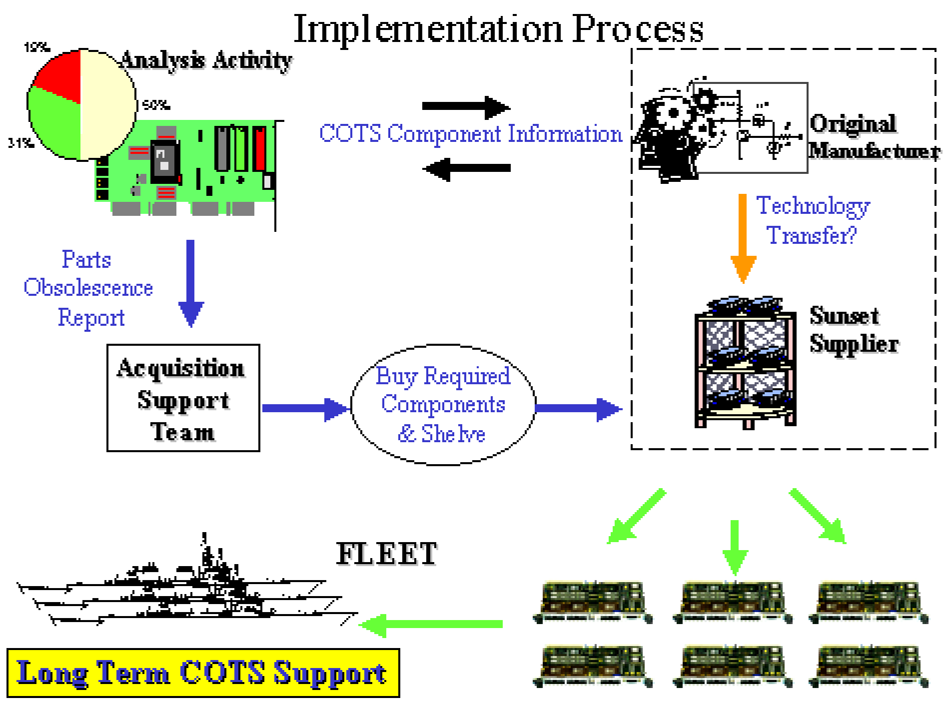

Figure 6: Implementation Process

4. Primary Output Products of the SEDI Plan

The SSB system provides a structured set of processes, methods, and tools embedded in the System Architecture based on a collaborative framework. Although the SSB system yields many sub-products, discussed below, the SEDI plan is focused on the SSB system as the product provided to the customer and as part of the system the sub-products identified herein make up a portion of that system. The SSB system employs information and risk sharing, relationship building, and long-term planning to yield definable, measurable, and reportable impacts to fielded systems. The customers (PMO and support teams) consider both the implementing of the SSB system and the report outputs of the SSB system as products. As such, the implementing processes such as information and risk sharing directly impact the qualitative output assessments like the obsolescence risk of COTS products in fielded systems. The customers expectations include visibility into the processes and qualitative/quantitative assessments that accurately define the subsequent output of the process. To meet these expectations we have developed the following implementation and output products:

1) Implementation Products

a. Status Metrics on the 17 Step Process - Vendor Status Report
b. Documented 17 Step Process
c. Prioritized COTS List & Vendor Information

2) Output Products
a. Obsolescence Health Report
b. High Risk (RED) Component List
c. Obsolescence Impact & Purchase Request Report
d. Assembly Master & Cost Matrices, with Definition Worksheet

The implementation products provide the insight to the customer regarding the qualitative assessment of programmatic risk with respect to the relationship building, information sharing, and risk management practices employed. The output products organize the data and information gathered then assesses the potential impacts and recommends proactive actions to mitigate programmatic risks. These processes, methods and tools are quantitative in nature and are presented in a format to provide input directly into the business and program management processes. Collectively these products represent new knowledge and options for the PMO and support team. Furthermore the modeling and simulation tools give the decision makers the opportunity to make side-by-side comparisons of different potential candidate recommendations prior to making the final decision.

Implementation Products

a) ***SEDI Context: Enclosure (17) "17 Steps" – SSB Implementation Process***

The "17 Steps" SSB system implementation process was first described in the System Architecture as a method to describe and document the list of sequential steps needed to implement the SSB system. These steps provide a notional depiction of the SSB implementation process and are supplemented with a set of definitions. These figures/definitions are also provided as enclosures for use by new implementers to assure consistency and repeatability of the process (see Enclosures (17) & (18)).

b) ***SEDI Context: Enclosure (23) Vendor Status Report***

The parts lists came in from the different OEMs at various times depending on the time of interface with the OEM and the response time from the OEM. The progression through this process was monitored through the use of a status matrix described in Enclosure (23) – Vendor Status Report. This status matrix was updated on a weekly basis and reported to the program support IPT as requested.

c) ***SEDI Context: Enclosure (15) SSDS MK 1&2 Prioritized, COTS List, Early Maturity***

The activity in defining the priority for each item is a teaming function where all members must actively participate to yield an adequate product. The dependence of hardware to software is of key concern in assigning the priority levels. In some circumstances, some assemblies will be inherently linked to other assemblies such that a change to one impacts the other and therefore need to be grouped as like priority in the overall scheme of the list. Enclosure (15) provides the combined SSDS MK 1&2 prioritized, COTS list, in a state of maturity about half way through the process. During the development of this workbook there were several spreadsheets that were used to develop the all-up list described in worksheet 4. This worksheet illustrates the identified COTS OEMs, the configurations of interest, the points of contact at the OEM, the amount of assemblies needed for the next 10 years at a 50% and 99% confidence levels, and implementation notes; all arranged in prioritized order. This worksheet was used extensively to communicate the what, who, how, and when regarding the SSB system implementation activities. Enclosure (16) presents the same workbook at a much later time, a review of spreadsheet 4 shows how this communication tool has been modified to give an update of the implementation process and identify actions and recommendations to the budgeting planning activities. Using these tools helps organize your efforts and aids in communication with the rest of the team.

The information regarding each company and all the configurations under consideration is extensive and will get confusing unless it is organized in a methodical way and the records are updated regularly and consistently. The example provided in Enclosure (15) - SSDS MK 1&2 prioritized, COTS list, illustrates the method that was

used during the implementation process for the SSDS programs. Key information provided in this matrix is typically needed during almost every contact with the potential candidates. The matrix also has columns to annotate information already gathered and actions yet to be taken. In essence the matrix is used much like a sales persons contact list in providing important information that is continuously updated to reflect the ongoing communication with the customer.

Output Products

d) *SEDI Context: Enclosure (24) Obsolescence Health Report*

On an annual basis or as requested by the PMO, the detailed information on all assemblies in the SSB system pertaining to a specific program are assembled into a single document and provided to that program as a SSB system update. Enclosure (24) – Obsolescence Health Report is the SSDS example of such a report. These reports are extensive since the following information is provided: the status of the SSB system implementation, the assemblies obsolescence health arranged per system indenture, a summary report of obsolete component piece parts (Red, high risk values), graphical depiction of the obsolescence health analysis, and executive summary for the system. The format and detail is dependent on the request or needs of the specific program, so before arbitrarily adopting the example format we suggest interfacing with your program before proceeding.

The following files are used to construct the Obsolescence Health Report and once assembled provide a complete obsolescence risk picture:

- SSDS Obsolescence Report, main body w/o Graphics
- Vendor Status
- Cover Pages for Appendices A, B, C, D
- Appendix A: MK1 Configuration List
- Appendix B: MK2 Configuration List
- Appendix C: MK1 Obsolescence Health, Graphical
- Appendix D: MK2 Obsolescence Health, Graphical
- Appendix E: SSB Implementation

e) SEDI Context: Enclosure (25) SSDS Red Component List

One of the products of the preceding step is a list of red coded piece parts identifying them a high obsolescence risk items. Enclosure (25) – SSDS Red Component List provides an example of such a list. These specific parts have been discontinued and soon will not be available for purchase.

f) SEDI Context: Enclosure (27) Obsolescence Impact & Purchase Request Report

The purchase of Grey Market parts will continue to be an ongoing function as new high-risk parts are identified. Depending on the impact both risk and financial, the purchase of obsolete parts may be as simple as an email form (see Enclosure (26)) or as formal as a detailed report. Enclosure (27) – Analysis of Intel's i680 obsolescence on OEM products – SSDS program – is a good example of how to structure a detailed impact and purchase request due to obsolescence. It will be important to automate this process as much as possible because there will be a continuous stream of these requests over the years the programs system need to be supported.

g) SEDI Context: Enclosure (28) SSDS Assembly Master & Cost Matrices

The last area of measurement and assessments is the "Capstone" of the entire SSB system's implementation effort. It brings together all the information and data collected and provides functionality previously unattainable without the SSB system - Systems Engineering approach. The "Capstone" assessment tool is illustrated in Enclosure (28) – SSDS Assembly Master & Cost Matrices. Every tool, method, and process developed to implement the SSB system is either directly or indirectly responsible for the numbers evident in the matrices. Enclosure (29) – SSB Planning Excel Workbook & Data Item Description - provides detailed explanations for the descriptions of each cell along with the mathematical relationships and constraints implemented within the worksheet.

IV. DATA ANALYSIS

A. INTRODUCTION

In this section the potential financial and non-financial consequences will be presented along with specific areas of benefit to the business process. An analysis of the cost data has been presented in the form of data summaries in Appendix C (The Business Case Analysis) for the SSDS MKI only. The SSDS MKI program supplied the most compete package of reliable financial data among the systems currently implementing the SSB system. In terms of non-financial, this document draws from all three programs (SSDS MI, SSDS MKII & AN/ASQ-20X). The data in this section is offered in an objective and broad manner. Where details are needed, guidance to specific appendices is given. The financial data and their contribution to the SSB implementation are fairly straightforward. Two separate model are used to estimate the costs to the program: The Resource Model and The Procurement Model. The resource modeling is accomplished using the NSWC Crane cost model, which takes into account all the various aspects of implementing an Engineering Change Proposal (ECP). This model covers over 128 functions/activities and is tailored to meet the needs of the application under consideration. The Procurement Model is provided in Enclosure (28) of the SEDI Plan and provides the ability to simulate various scenarios with "what if" procurement trade-offs to identify Navy "best value". The most optimal values resulting from the Procurement Model are fed into the Resource Model to estimate the total support costs to the program. Between these two models and a few other tools used in the SSB system, the program can get the "Big Picture" view of the supportability requirements for their program. Cost data is analyzed for various support scenarios under the SSDS MKI and alignment to specific goals is made. We make the obvious assumption that cost data and the results derived from analysis would be consistent across the other programs. Non-financial impacts are derived from both the Business Case Analysis as well as the Marketing Plan. As mentioned previously, the Marketing Plan includes the analysis of several environmental elements and effectively defines the strength and weakness of the SSB as well as potential opportunities or threats.

B. ANALYSIS OF RESULTS

In this section we derive usable, decision quality information from the results detailed in each of the four appendices. The results will be summarized and evaluated for their contribution to the business objectives. This section will address both financial metrics as well as non-financial implications.

1. Direct Financial Impacts

The direct financial impacts were derived from SSB implementation on the SSDS MKI program. The initial SSB implementation efforts were focused on the SSDS MKI program and therefore offered the most complete set of data. A logical assumption is made that extends these impacts to other programs. Detailed analysis is provided in Appendix C (The Business Case Analysis). First we will focus on the direct financial impacts which are discussed with some brief background information. To understand the full impact of SSB implementation several scenarios were considered. There are three primary scenarios that are viewed as the most practical given the current state of the SSDS MKI program. These three scenarios are considered the most feasible course of actions over the defined ten-year support period:

1) LTB (1) – This scenario is the likely track for COTS product support without any assistance from the SSB infrastructure. The costs for this scenario are the estimated financial impacts that the SSDS Program Office must plan for. The support methods are broken down into two methods: 1) Life of Type Buy (**LTB**), which is a bridge buy as described previously, and 2) **OTHER**. **OTHER** refers to redesign, spares utilization, reclamation from other Fleet assets or maintenance contracts.
2) SSB (1) – This scenario is the most appropriate implementation of the SSB infrastructure as agreed upon by the SSDS COTS Working Group (SCWG). Three main support methods are employed: 1) **SSB**, 2) **LTB** and 3) **OTHER** as described above.
3) SSB Optimized – This scenario implements the **SSB** method wherever possible. Certain support decisions were made for specific COTS products prior to the availability of the SSB infrastructure. Some COTS products have already been slated for redesign or reclamation efforts.

In addition to these scenarios, three additional scenarios are identified. These represent the "What-If" scenarios.

1) LTB Only – This scenario uses the LTB support method for all COTS products.

2) SSB Only – This scenario uses the SSB support method for all COTS products.

3) Complete Tech Refresh – In this scenario every COTS product within the SSDS is planned for redesign or technology refresh over the next ten-year period. The refresh is planned and scheduled based on "End of Production" (EOP) dates provided from the Original Equipment Manufacturers (OEM).

The financial aspects are summarized below for the six scenarios.

Scenario	First Year Costs	Total All Years	NPV Total All Years	Consumed Inventory	NPV Adjusted Total
Complete Tech Refresh	$2,316	$71,342	$61,089	$0	$61,089
LTB(1)	$5,924	$9,639	$8,651	$701	$9,352
SSB(1)	$3,440	$8,415	$7,333	$701	$8,034
SSB Optimized	$2,858	$8,665	$7,321	$701	$8,022
LTB Only	$5,234	$8,970	$7,981	$0	$7,981
SSB Only	$1,727	$9,170	$7,539	$0	$7,539

Table 1: Total Support Costs Scenarios ($K)

The above table demonstrates the potential savings in the first year as well as the overall costs to support the SSDS program over the defined ten-year period.

1) When the SSB process was implemented, regardless of degree, significant savings were realized. See column ***NPV Adjusted Total*** in the above table.

2) When the SSB process was implemented, the initial year costs were reduced indirectly proportional to the degree of SSB implementation. See column ***First Year Costs*** in the above table.

From the above table, a Complete Technology Refresh is the most cost prohibitive course of action, given a stabilized requirements baseline. With that said, the following table provides the procurement costs for each scenario, excluding a Complete Tech Refresh given the cost and complexity of estimating such an effort. Additionally, an adjustment has been made to the scenarios below as compared to the previous Table 1. Common to all scenarios in Table 2 – Procurement Costs – is the cost to refresh 9 items which regardless of which method chosen to provide long-term support, these refresh

costs must be paid. The 9 items for refresh were removed to present only the portion of each scenario impacted by the long-term support decision-making process. The removal of the cost of the 9 refresh items explains the cost deferential between the two tables 1 & 2. For details concerning this adjustment see Appendix C: Business Case Analysis.

Scenario	First Year Costs	Total All Years	NPV Total All Years	Consumed Inventory	NPV Adjusted Total
LTB(1)	$5,924	$7,069	$6,871	$701	$7,571
SSB(1)	$3,059	$6,854	$6,025	$701	$6,726
SSB Optimized	$2,477	$7,004	$6,012	$701	$6,712
LTB Only	$5,234	$6,400	$6,201	$0	$6,201
SSB Only	$1,346	$7,609	$6,231	$0	$6,231

Table 2: Procurement Costs ($K)

The above table demonstrates the potential procurement savings in the first year as well as the overall costs to support the SSDS program over the defined ten-year period.

1) When the SSB process was implemented, regardless of degree, significant savings were realized. See column ***NPV Adjusted Total*** in the above table. The figure for SSB Only is slightly larger than for LTB Only. The reason for this is because the SSB process requires a cost to purchase Red Parts each year, the first year being $534,011 and a total for all years of $828,426. The LTB methods make the assumption that they can purchase all the required items upfront for usage throughout the ten-year period and that all item will be consumed. There is risk involved with buying too many or not enough items in both the LTB and SSB cases. However, the substantial difference between the two alternatives is the investment risk of the total assembly (the LTB case) at say $6500.00 versus the investment in component parts (the SSB case) at a mere $40.00 then buying the total assembly later when the Navy needs it.
2) When the SSB process was implemented, the initial year costs were reduced indirectly proportional to the degree of SSB implementation. See column ***First Year Costs*** in the above table.

When we perform standard deviation calculations over the ten-year period we get the following.

STD DEV	LTB(1)	LTB Only	SSB(1)	SSB Optimized	SSB Only
2003-2012 All Years	1836	1617	836	627	231
2004-2012 Excludes Initial Year	100	102	55	61	111
2004-2011 Middle years	105	108	10	7	16

Table 3: Procurement Costs STD DEV Year-Year ($K)

1) When the SSB process is implemented, we experience a more stabilized funding profile for procurement, particularly for the middle eight years. See the above table.

When we look at total support costs for each scenario we get the following STD DEV Year-Year Total Costs. Remember, for the LTB(1) and SSB(1) scenarios we had to take into account a redesign effort for nine COTS items. This cost is incurred early in the ten-year period and affects the overall stability of the funding profile.

STD DEV	LTB(1)	LTB Only	SSB(1)	SSB Optimized	SSB Only
2003-2012 All Years	1896	1597	1322	1208	303
2004-2012 Excludes Initial Year	1068	508	1135	1131	111
2004-2011 Middle years	1056	526	1188	1186	16

Table 4: Total Support Costs STD DEV Year-Year

1) When SSB is implemented early enough we can effectively avoid any redesign costs that would be needed due to obsolescence during the ten-year period and therefore expect the greatest stability in the funding profile over the ten-year period.

The percentage of overall <u>initial</u> costs associated with each scenario is given below.

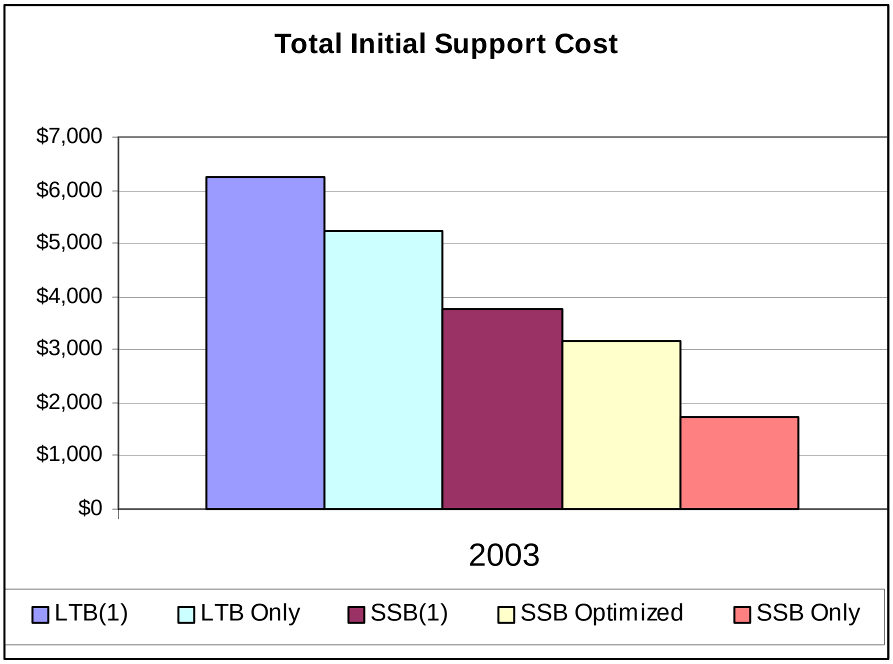

Figure 7: Total Initial Support Cost

1) When the SSB process was implemented, the initial cost as a percentage of the total cost to the program was significantly reduced depending on the degree of implementation. This helps to reduce the risks associated with making large upfront investments because the costs are more evenly distributed over the entire ten years.

2) When the SSB process was implemented, the costs are more evenly distributed over the ten-year period depending on the degree of implementation. This is more desirable for planning and budgetary purposes.

The following table provides the costs associated with having to redesign those COTS products that were targeted for redesign prior to SSB implementation. These items were determined to become obsolete prior to the end of the support scenario, and unsupportable via traditional support mechanisms or with the SSB system.

WBS Element	Total ($K)
Total	**7063**
Configuration Management	**126**
Hardware/Software Engineering	**1684**
Testing And Documentation	**944**
Procurement	**3866**
ILS Planning and Management	**337**
Installation	**107**

Table 5: Re-design Cost Avoidance, 9 Items

1) The total cost that could have been potentially avoided if the SSB process had been implemented for those identified COTS products is approximately $7.063M.

This $7.063M cost is considered the potential Avoided Costs when implementing the SSB process if applied immediately after the SSDS design was baselined and before irreversible obsolescence takes place. The optimal time to implement the SSB system is the earliest point in the systems design process where a stabilized baseline can be identified.

The following summaries show the savings in $K for procurement, resources and the total support costs between the two most practical scenarios (LTB(1) and SSB(1).

LTB(1) Procurement Cost (Typical scenario)	$6871
SSB(1) Procurement Cost (Actual SSB Implementation)	$6025
Procurement Savings ($K)	**$ 846**
LTB(1) Resource Cost	$1780
SSB(1) Resource Cost	$1308
Cost Savings ($K)	**$ 472**
LTB(1) Total Support Cost	$8651
SSB(1) Total Support Cost	$7333
Cost Savings ($K)	**$1318**

Table 6: Cost Savings SSB(1) versus LTB(1) ($K)

1) When the SSB process was implemented significant cost savings is realized.

The following data illustrates the potential savings of the current typical support scenario of LTB and a required tech refresh of nine items and SSB for all COTS products upfront.

LTB(1)	**$8651**
SSB Only	**$7539**
Potential Cost Savings ($K)	**$1112**
Cost Tech Refresh of 9 Items	**$7063**
Cost to SSB the 9 Items	**$669**
Avoided Cost Savings ($K)	**$6394**
Total Potential Cost + Avoided Savings	**$7506**

Table 7: Total Cost "Savings & Avoidance" Using the SSB ($K)

1) If SSB was implemented for all COTS products early enough we can essentially avoid the cost associated with a required partial tech refresh.

The final summary of data looks at the extreme cases. The following illustrates the total support cost savings between implementing SSB early in the acquisition cycle to affect all COTS products and redesigning all COTS products.

Complete Tech Refresh	**$61089**
SSB Only	**$ 7539**
Procurement Savings ($K)	**$53550**

Table 8: Cost Savings: SSB only Versus Complete Tech Refresh ($K)

In looking at the SSB portion of the first year procurement costs for each scenario we get the following table.

Support Method	Non SSB Costs	SSB Costs	SSB% of Total Costs
LTB(1)	$5,924	$ 0	0.0%
LTB Only	$5,234	$ 0	0.0%
SSB(1)	$2,097	$ 962	31.4%
SSB Optimized	$1,321	$1,156	46.7%
SSB Only	$ 103	$1,243	92.3%

Table 9: Initial (First Year) Procurement Costs Comparison: SSB Versus LTB

1) For all but the '*SSB' Only* (scenario four), the majority of the initial procurement costs are associated with non-SSB support mechanisms.
2) The greater degree of SSB implementation the lower the initial investment and thus lower program risk.

In comparing the resource models for the traditional LTB methods and expected SSB implementations we notice similar orders of magnitude for total costs.

WBS Element	Actual ($K)	Traditional ($K)
Total	**8415**	**9639**
Configuration Management	**0**	**57**
Hardware/Software Engineering	**0**	**0**
Testing and Documentation	**0**	**0**
Procurement	**10**	**7069**
ILS Planning and Management	**0**	**2354**
Installation		**158**
Sunset Supply Costs	**8404**	**-**

Table 10: Comparison of Total Resource Costs: SSB & LTB

The SSB infrastructure absorbs nearly all the costs for supporting COTS products over the ten-year period.

1) The expected scenario provides infrastructure to support the SSDS program, resulting in greater flexibility and manageability for the program manager.
2) Implementation of the SSB infrastructure is possible at the same or lower cost to the program as traditional LTB methods.

2. Non-Financial Impacts

Certain non-financial impacts materialize based in part on financial consequences. In order to successfully evaluate the results of implementing the SSB process we must look at these non-financial aspects in light of the business objectives. But first we must clearly derive such impacts. Since no clear financial metric can be applied to these impacts we will discuss them in broad terms and in ways that can be observed and verified. The approach here will declare a financial outcome or business practice of implementing the SSB infrastructure, and explain in non-financial terms the tangible impact.

a) *Low Initial Expense*

By reducing the upfront costs for procuring expected spares, the SSB process brings improved flexibility to planning and budgeting. If the initial costs are large then the PMO is forced to stay the course for the entire period in order to derive the maximum return on investment. Changing program direction during the ten-year period would be difficult to argue given the number of spare COTS products that would become potentially useless. Under the SSB infrastructure much of the initial costs are still

associated with non-SSB support mechanisms; therefore, these costs will be absorbed in the event the program did not make use of the assets that were procured. In the *All SSB* scenario, nearly all, about 92%, of the upfront costs are for SSB support. The benefits associated with this cost are immediately realized, that is the procured COTS items are deployed to the Fleet for use upon purchase. Furthermore, in the event that performance requirements change, driving a change in system design, the risks are greatly reduced since less of an investment was made for spares that may not be needed. So therefore the SSB process effectively reduces the risk of overspending early in the support cycle.

Derived Benefits:

- Cost Savings
- Flexibility
- Reduced risk
- Stability

b) *Stable Funding Profile*

The SSB process spreads the procurement costs more evenly throughout the ten-year period. This makes efficient use of funds and is easier to budget and manage. The yearly costs are higher under the SSB, but that's because no investment in spares was made the first year. Nevertheless, as before, the costs associated with these years are for forecasted replacements on an as need basis. The costs are incurred at the moment a requisition is made for a replacement COTS item. The benefit is immediately realized. Furthermore, by procuring COTS replacement products only on demand the program manager makes better use of funds. Also, continual market surveillance is practiced throughout the support cycle providing real-time data in terms of obsolescence and diminishing materials. In this way the program manager is better equipped to make effective decisions that benefit the overall program. This environment creates a flexible process that by taking a proactive posture can react to changes in material availability.

Derived Benefits:

- Stability
- Efficient use of funds

- Flexibility
- Risk Mitigation & Management

c) ***The Sunset Supplier Shares Risk***

One area of cost savings not addressed was the cost to the Navy for stockage, storage and issue of COTS spares and repair parts. These are costs not directly borne by the SSDS program. But in addition to the cost savings to the Navy for not having to house, manage and transport these COTS items, the Sunset Supplier now assumes the responsibility, and thus risk, of facilitating these functions and recoup the value added by adjusting the product purchase price by 5% on each COTS item procured.

Derived Benefits:

- Risk Mitigation & Management
- Shared Risk
- Shared responsibility
- Collaborative Environment

d) ***Extending COTS Supportability***

By implementing the SSB process early enough in the program, we can effectively extend supportability for these items. And in fact we can extend the reparability of these items by identifying and procuring near-obsolete components (Red Parts). In this particular case (SSDS MK 1), by the time the SSB infrastructure was in place, it was too late to mitigate the re-design cost on 9 items and the subsequent cost the program was an additional 7 million dollars. The planning for redesign carries certain risks as well. DoD will almost certainly use COTS products for the commercial technology advantages, touched on earlier in this document, applying the technology to work towards specific warfighter performance requirements. For the COTS products identified on the SSDS MK 1 program, the items were determined to be obsolete by 2005-6 timeframe. Now remember that there is a 2-3 year planning period and additional 5-7 year implementation period for new designs. If the period of concern starts in 2003, the COTS products will become completely unsupportable before the planning phase even ends. By implementing the SSB process we effectively avoid this situation by

extending supportability of the COTS products so that warfighter requirements can continue to be met while plans are made to upgrade the system. By stabilizing the system baseline in this way we mitigate the risks of not being able to support the warfighter to acceptable levels.

Derived Benefits:

- Extending COTS Supportability
- Extend COTS Reparability
- Cost Savings/Cost Avoidance
- Stabilize System Baseline
- Risk Mitigation & Management

e) *Initial Investment*

The initial cost for setting up the SSB infrastructure and making the initial COTS product assessments was approximately **$380K** (see Appendix C). This is a minor investment considering that the realizable return is substantial depending on how early in the acquisition cycle SSB is implemented. For example, the cost of support for the present SSDS before SSB was considered was estimated to be $8651K plus an additional partial tech refresh cost of $6394K (total of $15045K). The estimated cost of implementing SSB early enough to affect all COTS products was $7539K. The potential savings is roughly $7.5M. That in itself, is a wonderful marketing element, however there is also another point to be made; and that is that this setup and assessment can be performed for any program. Thus, the SSB process is transportable and repeatable. And as the proliferation of COTS products increases throughout the military, there is a strong likelihood that commonality of COTS products across weapon systems will grow. Having a SSB process that maintains and continually updates a database of these COTS products for usage, obsolescence, and diminishing materials will provide a tremendous benefit whose value will grow exponentially. Thus, the SSB process is also expandable. This initial investment is made within the DoD, tasking Navy resources to perform supportability assessments and DMSMS/Obsolescence Management. The reports generated become government property and distributed among the DoD Program Offices as well as commercial support entities (Sunset Supplier, OEMs, system integrators, etc.).

Therefore other programs can leverage the data and the relationships from the SSB infrastructure. This initial investment is also used to fund the government facilitating activity for pursuing and coordinating potential OEM and Sunset Suppliers, a reusable collaborative resource.

Derived Benefits:

- Transportable, repeatable and expandable.
- DMSMS/Obsolescence reporting
- Collaborative Environment
- Coordination

Summary of Benefits	
Financial	**Non-Financial**
• Reduced Procurement Cost • Lower Upfront Costs • Significant Cost Avoidance • Stabilized Funding Profile • Overall Cost Savings to the Program	• Flexibility – Planning & Budgeting • Reduced risk • Stability –Funding Profile • Efficient use of funds • Risk Mitigation & Management • Shared Risk • Shared Responsibility • Collaborative Environment • Extending COTS Supportability • Extend COTS Reparability • Stabilize System Baseline • Transportable, repeatable and expandable. • DMSMS/Obsolescence reporting • Coordination

Table 11: Summary of SSB Financial and Non-Financial Benefits

SSB Specific Goal	Derived Benefit
Achieve significant and quantifiable cost savings over the product life cycle.	• Reduced Procurement Cost • Lower Upfront Costs • Significant Cost Avoidance • Stabilized Funding Profile • Overall Life Cycle Cost Savings to the Program
To be able to identify, quantify, and mitigate supportability risk to programs.	• DMSMS/Obsolescence reporting • Reduced risk • Risk Mitigation & Management

SSB Specific Goal	Derived Benefit
	• Shared Risk
Extend the life cycle and supportability of COTS.	• Extending COTS Supportability • Extending COTS Reparability
Provide infrastructure to support existing platform/combat systems in support of the Program Office.	• Transportable, repeatable and expandable. • Coordination • Collaborative Environment • Infrastructure support for existing weapon systems
A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).	• DMSMS/Obsolescence reporting • Transportable, repeatable and expandable. • Stabilize System Baseline
Institutionalize methods for proactive management of COTS including DMSMS issues.	• DMSMS/Obsolescence reporting • Collaborative Environment
A system that leverages Navy and commercial supportability assets and provides a networked solution.	• Collaborative Environment • Shared Responsibility • Shared Risk • Coordination
Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation.	• Flexibility – Planning & Budgeting • Transportable, repeatable and expandable • Collaborative Environment
Forecast budget requirements in support of the programs/war fighter/consumer	• Flexibility – Planning & Budgeting • Efficient use of funds • DMSMS/Obsolescence reporting
Improve schedule flexibility and support options of system upgrades or new development initiatives.	• Flexibility – Planning & Budgeting • Extending COTS Supportability • Stabilize System Baseline

Table 12: Alignment with SSB Specific Goals to Derived Benefits

C. INTERPRETATION OF RESULTS

From the above analysis we can make several convincing recommendations for SSB acceptance; however, we must also understand the environmental forces that

constrains SSB implementation in order to develop a clear picture of SSB viability and value. Appendix D (The SSB Marketing Plan) provides a detailed analysis of customer, competitor and SSB system elements. The outcome of which provides resource requirements, such as people, implementation control requirements, which provide criterion measures for SSB implementation success, and finally, likely evolutionary changes for future SSB implementations. Together the above tabulated results and the Marketing Plan, the following results are provided in terms of strength, weaknesses, opportunities and threats:

1. Strengths

Strength 1: The SSB system provides an expandable, transportable, Life Cycle Cost (LCC) reducing processes, methods, and tools.

The expandable characteristic of the SSB system allows it to be applicable to most any program regardless of size. This scalability ensures that the SSB system will be able to keep pace with a programs growth and the addition of other COTS products as the programs system is modernized. The transportability feature addresses the issue of long-term support of the SSB system itself so if it was no longer viable to receive services from the current Organic activity providing the service then at the programs option the support function could be moved to another activity. Simply stated this feature assures the longevity of the SSB systems support. The LCC reductions possible due to the implementation of the SSB system is the strongest driver for the SSB system acceptance. These reductions are one of the most unique characteristics of the SSB system and a clear differentiating attribute which impacts one of the most prominent metrics the PMO's success is judged against, Life Cycle Cost. The documented processes, methods, and tools provide assurances to the customer that the service received through implementing the SSB system is repeatable, continuous, and reliable. These documented practices have been delineated in the Systems Engineering Development and Implementation (SEDI) Plan (Appendix B) with detailed examples, instructions, templates, processes, etc. which can be immediately implemented. The LLC reductions are offered in the Business Case Analysis (Appendix C) with detailed financial metrics. Generally speaking, the characteristics of the SSB process as described here, makes the SSB system an additional alternative to the PMOs in resolving obsolescence issues. However it differs from the

dozen or so point solutions currently available in three distinct ways: 1) the collaborative architecture necessitates the use of close partnerships with the supply base and includes these entities in the resolution process and in the business planning, 2) the Systems Engineering approach embedded within the SSB system optimizes on the LCC and long-term support providing a structure spanning all functional disciplines life cycle elements, this allows other point solutions to be incorporated where appropriate to achieve maximum utility, and 3) the SSB system when used at the appropriate time yields the lowest LCC and best value risk management process for COTS products. All three of these attributes impact the program's ability to provide long-term support of COTS products and are reflected in the evaluation criteria used in assessing the PMO's accomplishments, as viewed from their sponsors.

Strength 2: The SSB system provides new supportability options to the PMOs.

The SSB system reduces the amount of program investment, extends the repair/depot support, and establishes methods to reduce the mean logistic delay time for supplier supported COTS products. The investment the program would need to make to cover the spares required over the supportability period will be drastically different when using the SSB system's methods and processes, as compared to usual method of support of Life of Type Buy (LTB) option. Refer to Appendix C (Business Cass Analysis) for a detailed discussion and comparison of various support scenarios. The potential savings on a specific item may seem minor, but when an aggregate of cost over all COTS products on a given program/system is rolled up, to quantify the immediate cost to the program, the amount is usually staggering. Additionally, the SSB system support allows the PMO to meet budgetary constraints while providing long-term supportability requirements. The close partnership with the supply base provides insight into not only the obsolescence issues but also gives the Navy the chance to negotiate for long-term supplier support of fielded products for repair and maintenance. The experience gained during the implementation of the SSB system on three programs showed that every SSB participant was capable and willing to perform these needed depot functions. The relationship building accomplished as part of the SSB implementation process also addressed another Fleet need, that is the suppliers would be capable and willing to help

with quick turnaround times for field returns. Many of the suppliers are willing to keep a spare COTS item on their shelf to replace immediately a Fleet returned unit, this could bring the turnaround time to days instead of weeks or months. The key to success here is partnering and collaboration. The benefits of these are obvious and the SSB system is the only alternative that institutionalizes the Navy-supplier partnerships through a well-defined infrastructure and set of implementation tools. As part of the process the PMO (customer) defines the supportability boundary criteria, such as - How many years does the fielded system require support till the next tech refresh activity? Only the SSB system allows the customer to choose the length of support desired, all other support methods are reactive and as such require the program to react with a point solution constraining the possible alternatives and associated time elements. The structures set in place by the SSB system provides additional opportunities for the PMO to perform business planning such as PPBS, funding allocations, and equipment install scheduling. The System Engineering approach inherent in the SSB system provides these added benefits, which are not available through the use of point solutions.

Strength 3: The SSB system provides a proactive COTS obsolescence risk management process.

The customer has a need to support fielded systems for extended periods of no less than 5 years but support could be required up to 15-20 years. Since COTS products generally have life spans of 2-5 years after which supportability is not an option without some type of intervention. The SSB system is a planned intervention that is based on the support needs as identified by the customer. The partnering and information sharing between the supply base and the Navy, provides insight to previously undisclosed potential obsolescence risks of COTS products. Combining this new knowledge with the SSB infrastructures yields the risk management methods, processes, and tools for use by the PMO to proactively address the inherent COTS risk issues. The SSB system was specifically designed to be the first alternative containing architectural elements capable of addressing the risk issues involved with COTS products. The key to success in managing this risk is the use of a systemic, broad based, life cycle approach to deal with the entire fielded system. These key elements are absent when using the point solution approach employed by the other alternatives. The SSB system is the only practice,

known to the authors, which provides opportunities to the customer to address risks previously identified as large and open-ended programmatic risks.

Strength 4: The SSB system provides the infrastructure to enable Business planning and Management system for fielded system containing COTS products.

Management of fielded systems containing COTS products has historically been a very difficult and unsuccessful venture for PMOs. Several characteristics of the COTS products compound the management efforts and make it exceedingly difficult to maintain control over these products, the major exacerbating attributes are: 1) the OEM controls the configuration of the product and may change it without notice, 2) the rate of change of the COTS products is measured in months (i.e. < 18-24 months product life cycle) whereas Fleet installation is measured in years, and 3) many COTS products do not have long-term support available. The SSB system was specifically designed to address these issues – "head on" – with methods to gain the configuration knowledge and potentially freeze that configuration if needed, and finally the issue of long-term support and obsolescence management is addressed through processes and tools embedded within the system. As an emergent new property of the SSB system due to the long-term planning and holistic view taken, the knowledge gained regarding the fielded systems, identifies the input data necessary to perform long-term business planning such as: estimated spares required each year of support, an estimated dollar value needed each year to extend the COTS life cycle, and the total amount of proposed budgetary requirements. The SSB system provides the first system, which yields this type of knowledge that is based on justifiable detailed information used in predicting the estimates.

With the designed-in and emergent properties of the SSB system the PMO (customer) can now control, manage, and plan; the physical support of the hardware along with the business support (i.e. the PPBS, resource allocations). No point solution alternatives can produce these systemic characteristics and the PMOs have been requesting such a solution with no implement able practices identified until the SSB system was introduced.

2. Weaknesses

Weakness 1: The SSB system is a new system with a very small track record.

The first issue that emerges due to the low level of implementation of the SSB system is a concern that, regardless of the outcome of the first implementation efforts, has the system been adequately tested out and found capable for every or most every application. Like any new system - performance over time - will be the arbitrator for the inclusion and growth of the SSB system. The lack of long standing track record will impact the acceptance of the system by well-established support teams, who are typically conservative and slow to incorporate new approaches. Although the point solution alternatives lack many desirable characteristics obtained through the use of the SSB system, the point solutions have been used to support the existing fielded systems and therefore have a proven track record and an expected outcome. A PMO or their support team will need to perform a trade-off analysis with regards to comparing existing methods and solution alternatives with the SSB system's attributes. Depending on what criteria is used and who is making the decisions, the SSB system may or may not be considered as a potential alternative. Possible roadblocks and constraints are described in the "Competitive Forces" section of the Marketing Plan and provide insights to the motivation behind some group or person wanting to exploit this weakness.

Weakness 2: The SSB system necessitates the up-front PMO support and a long-term commitment on behalf of the PMO and the support team.

The SSB system is built on a collaborative architecture that necessitates the voluntarily participation of its members. As with most proactive methodologies the SSB system requires some up-front investment to initiate any kind of return. Typically before the PMO will invest in a potential alternative they will want to know what kind of return can be expected and what kind of risk they are taking. Compared to point solution alternatives, which are usually singular events, the SSB system requires continuous support over the life cycle of the fielded COTS products, in essence locking the PMO into a long-term commitment. Both the up-front support and the long-term commitment present the PMO with a potential risk to the program with respect to funding and technical support issues. The PMO or their support team will need to perform a trade-off

study, formally or informally, to identify the cost-benefit comparison in using or not using the SSB system on their specific program. The approach taken in performing the trade-off study will be reflective of the outcome. If the approach focuses mostly on the short-term results with little attention paid to the long-term outcome, then a point solution alternative may look the most promising. However if the long-term view is taken and the focus is on LCC and reducing programmatic risk the most probable outcome will be implementing the SSB system.

Weakness 3: The SSB system is not part of the mainstream contracting process implemented by NAVICP.

When a PMO tasks NAVICP to contract for the program support functions, any Organic activity providing DMSMS/obsolescence support functions are specifically excluded from participating in the contracting process; this exclusionary policy includes the SSB system. Unless the PMO has an awareness of the situation and interjects the desire to peruse the SSB system specifically, the SSB system will not even receive consideration as a possible alternative. As identified in the Marketing Plan under the section labeled – "The Performance Based Contracting Environment" – the implementation policies and guidelines imposed by NAVICP do not allow a competitive environment with a level playing field and constrain Organic activities potential involvement to one in which places the government employee in a "conflict of interest" position. These exclusionary policies directly hinders the PMO access to the SSB system and provides a contracting situation in which the Navy may not have the potential to receive the "best value" for services under contract. In the analysis thus far, various solution alternatives were compared to each other in competing for resources, however with the exclusion of all potential alternatives except as deemed appropriate by NAVICP the situation shifts the argument. If the PMO tasks NAVICP to contact for the support functions, no competitive environment exists and no consideration can be made by the PMO regarding the utility and cost effectiveness of the SSB system.

Weakness 4: Implementation of the SSB system will require a cultural shift from an independent competitive environment to a collaborative interdependency of diverse functional groups.

The PMO support teams that have already been established to take care of the DMSMS issues and are quite diverse with respect to the teaming methodology while developing their current cultures. Many of these teams use working group techniques where work is accomplished off line in functional silos then brought to the team for approval expecting only minor changes. Some of the support teams accomplish their work as an IPT and leverage the cross functional aspects of the group. Sometimes the PMO support comes from independent functional silos that have little use for the teaming atmosphere. The variations of the support efforts are to numerous to mention although there seems to be an underlying base assumption that all activities and/or functions are vying for the same resource pool of funding. The SSB system to be successful must foster an atmosphere of a "win-win" scenario and staying away from the "zero sum game" so prevalent in funding resource struggles. The SSB system will need inputs from and provide outputs to, almost every function on the support team and therefore the interdependency relationships need to be established and matured. The lack of a SSB system friendly environment does not spell out failure for the system but such an environment will impede implementation progress and constrain the potential benefits from the system. The comparison between, the way support teams currently do business and the practices used in the SSB system will be evident over time and will be unique to each team. The implementation of the SSB system will require a certain amount of cooperation and adjustment but these changes are usually possible within most groups established cultural norms. From the perspective of the customer, the cultural shift is more of a challenge that should be eventually overcome instead of a "better or worse" attribute.

3. Opportunities

Opportunity 1: Meeting the PMO objectives in providing Life Cycle Cost (LCC) reductions of 50% or more on all systems.

The LCC is one of the primary evaluation criteria placed on the PMO during their annual and semiannual reviews. One of the biggest issues the PMO faces when

quantifying the LCC is in defining the parameters that need to be measured and tracked. The structure of the SSB system encapsulates these metrics into a reporting system that keeps the PMO abreast of the projected and actual costs incurred by the program with the added benefit of incorporating other non-SSB point solutions. In this way the PMO has an oversight view regarding the true cost of support of the programs systems. With the results of the three pilot programs available to us, we can take these results and draw comparisons with other target programs, which have shown interest. The three example programs were specifically chosen because each represents a specific part of the developmental cycle such as: the 20X Sonar Mine Detecting Set program is just finishing the Engineering and Manufacturing Development (E&MD) phase, the SSDS MK 2 is in the Production phase with less than one eight of the projected units fielded, the SSDS MK 1 is considered a legacy system with 17 fielded system that need to be support, as is, for the next 10 years. The most complete data set we have compiled, at the time this paper was written is for the SSDS MK 1 systems although the data for the other systems are still being compiled and so far seem to reflect the same type of LCC reductions as experienced with the MK 1 systems. With this implementation experience we can capitalize on the fact that we can address programs regardless of where in the developmental life cycle they are, and we can use the captured MK 1 data set to show expected reductions in LCC.

Opportunity 2: The SSB system defines pro-active risk management methods for COTS products that provide the Fleet user with the assurance that their system will be supportable over time and available when needed.

Risk management like LCC is an evaluation criterion for the PMO and carries considerable weight with their resource sponsors in obtaining and keeping their funding allocations. The SSB system is the only post design pro-active method, known to the authors, that is capable of yielding a quantifiable COTS obsolescence risk management method. The SSB system identifies the current risk state and a projected risk state in a measurable fashion so that it can be tracked and trended. These metrics can then be used by the PMO as objective evidence in justification of the funding allocations. Since the risk management methods are an inherent part of the SSB system and reflected in the reporting processes and tools a direct analogy can be made with any new potential

program and the three programs successfully implemented. The reporting products used on the three programs are by design simple graphical representations so they can be readily identifiable by the PMO representatives. To gain the most leverage out of the work already accomplished, the previously prepared risk reports will be briefed to any new potential candidate programs making a direct comparison between the benefits received by the previous program and the candidate program.

Opportunity 3: Growth and maturity of the SSB system provides greater opportunity for other Navy programs to leverage this unique internal resource expanding its value proposition to the Navy.

The first programs that supported the implementation of the SSB system had no previous work to leverage from and therefore needed to pay for each relationship building effort and every configuration assessment. However with over 40 OEM relationships established and analysis of over 100 configurations, the next programs to implement will more than likely use a portion of the previous efforts. The expectation is that over the next 5-7 program implementations, the amount of reuse of previous work may be as much as 10-15% of the total effort. The implementation efforts which follow are expected to have an increased percent of reuse perhaps eventually yielding as much as 50% reuse in later implementation efforts. As the SSB system is used, implemented, and matured the more utility the programs receive from it and the programs sponsors will look favorably upon the use of the system since it was their resources that are being reused instead of being spent on efforts which “reinvent the wheel”. The actions that are being taken to exploit this reuse characteristic of the SSB system are to make available the list of OEM participants and the specific configurations that the SSB system was implemented on. On a personal sell level we use the current listing as an example of the potential out come, then identify if any of the configurations appearing on the list or OEM names on the list are a match to the new potential candidate system. If an exact configuration match takes place, we offer to share the obsolescence risk analysis with the new program. If further interest is apparent and the program is willing to engage further analysis, we could work with program representatives to prepare risk mitigation report specific to the program’s needs (i.e. part number obsolete, how many parts per assembly, how many assemblies per new system, how many new systems, how long is the expected

support window, etc.) A quick demonstration of the SSB systems capabilities will illustrate to the program the real utility of the information and the subsequent knowledge gained through its use. In order to reach a large or mass audience with this information, we have near term plans to post the information on a web site used by our target audience. The GIDEP (Government Industry Data Exchange Program) web site (www.gidep.gov) has over 1,500 membership organizations boasting a user pool of over 4,500 individual users. During the mil speck era before Acquisition Reform, membership in this system was one of the acquisition requirements for all Navy programs and their prime contractors; therefore most of our potential new program candidates will have access to this system. The GIDEP organization has agreed to host a list of OEM participants and the specific configurations contained in the current SSB system active participation lists. All presentation materials and future announcements will subsequently be updated to reflect this reference whereby it can be tapped as a ready reference.

Opportunity 4: The SSB system employees several simulation and modeling tools to optimize the business planning and future support requirements for fielded program systems.

As part of the implementation effort regarding the SSB system, detailed resource and procurement models were prepared for the SSDS MK 1 system from which various scenarios can be simulated iteratively and recursively showing the possible outcomes. It can easily be demonstrated that the structure of these tools allows modification and customization to be applicable to most any program. Furthermore the results of running the various models using the SSDS MK 1 data provides a stunning real life example of the positive results attainable through SSB system implementation. To the authors' knowledge, no other system or method has identified a method to work within the PPBS funding system to support an overarching DMSMS support system. These models are tailored to reflect the requirements of the PPBS system such that the outputs from the models could be directly transferred to the Funding Allocation Request (FAR) an input to the PPBS system. The procurement models identify within the constraints leaved by the program, the expected level of support with regards to the hardware for each year of support. These levels are predicted based on the actual failure rate exhibited in the Fleet.

The resource modeling is accomplished using the NSWC Crane cost model, which takes into account all the various aspects of implementing an Engineering Change Proposal (ECP). This model covers over 128 functions/activities and is tailored to meet the needs of the application under consideration. Between these two models and a few other tools used in the SSB system, the program can get the "Big Picture" view of the supportability requirements for their program. Every program has a requirement to substantiate and justify their business planning (funding and allocation), support strategy, and risk management efforts. Knowing these requirements and the inherent capabilities of the SSB system, which are designed into the system to meet the program needs must be communicated when presenting the system to a candidate program. Again the use of the SSDS MK1 data set in the models then running simulations structured around the constraints of the candidate program can be an illustrative and convincing tool. These simulations can be run quickly providing immediate results to show the new candidate program that the constraints presented by their program can fit within the modeling structure. In showing the applicability of the tool and methods within the confines of the candidate program will provide them some assurance of potential success. The confidence gained through these demonstrations may be enough to bridge the gap and provide a comfort level great enough to make the up-front commitment and provide adequate resources to implement the SSB system on their program.

Opportunity 5: The Naval Audit Service (NAS) has recently released reports indicating that the implementation of the Contractor Logistic Support (CLS) contracting methodologies used by NAVSEA and SPAWAR lacks adequate visibility and metrics that would assure proper oversight.

The NAS report numbers N2002-0049 [17) NAS NAVSEA] and N2002-0069 [18) NAS SPAWAR] both identify a lack of a performance plan, strategy, or management control to implement the CLS acquisition reform initiative by NAVSEA and SPAWAR respectively. The lack of controls and measurements to achieve the desired results of reduced cost and improve system availability was identified as an inadequacy in Program Management. CLS can and many times does take into account the DMSMS support functions usually in the form of Performance Based Logistics (PBL) contracting methods. As discussed earlier in this plan, PBL contracting methods do not provide the

most advantageous environment for the Organic field activities participation including the use of the SSB system. Both SYSCOMs (NAVSEA & SPAWAR) need to develop reporting and management structures to overcome the identified shortcomings.

The BCA prepared in support of the SSB system in conjunction with the reporting mechanisms inherent to the SSB system will meet these shortcomings reported by NAS. The reporting and management structures needed by the SYSCOMs, have already been set up and are functioning, available only if the programs choose to implement the SSB system. The SYSCOMs management and the Program Managers need to be informed of the availability of the SSB system in order to leverage the currently available assets. This additional attribute of the SSB system should be announced at the same time we communicate the potential negative impacts when CLS or PBL are implemented through NAVICP using their exclusionary implementation practices.

> **Opportunity 6: In early September 2002 Secretary of Defense office rescinded the existing DoD 5000 series documents with a memo that stated, the identified hard requirements – the "must do" – Systems Engineering methods will be replaced by a guidance document to provide more leeway to the Program Managers[19)DJSM].**

The removal of requirements documents relaxes the discipline required by the implemented processes and inevitably produces larger risks to the Program Manager (PM) and the acquisition process. To be successful in a requirements poor environment the PM must institute risk management methods and practices to maintain control or at least visibility into the program activities. With this new change of direction from DoD the need for the risk management disciplines increases dramatically and must be instituted on a continuous ongoing basis.

The communications with the customer base should identify the obsolescence risk management attributes of the SSB system and how these attributes provide the PM with the visibility into the program activities. One of the keys to illustrating the utility of the system will be in displaying reporting products from previously assessed COTS products on other programs especially if they are also used on the PMs' equipment. The continuous and all encompassing insight provided through the reporting mechanisms as part of the SSB system are packaged and tailored to meet the needs of the program.

4. Threats

Threat 1: Current contracting implementation policy regarding Performance Based Contracting (PBC) may curtail or eliminate the possibility of using the SSB system.

As identified in the preceding material the implementation policies of NAVICP can preemptively exclude the participation of all Organic activities and therefore exclude the SSB system. The PMO may unknowingly task NAVICP to subcontract out the DMSMS support functions believing that the "best value" for their program will result from a competitive environment. As discussed in detail in the Marketing Plan, NAVICP does not provide a competitive environment nor do their processes assure "best value", therefore without prior knowledge of the contracting environment or intimate knowledge of the capabilities of the SSB system the programs may never know of these shortcomings. NAVICP's exclusionary policies are either: 1) an unintended consequence of their goal to streamline their processes, or 2) a sub optimization that optimizes their processes while in the grander scheme of things does not provide the Navy with the "best value". Regardless of the reason or logic behind these policies the impact of them needs to address. A three pronged approach is recommended in dealing with the current situation: 1) address NAVICP directly through a set of meeting with the decision makers to illustrate the impacts of the policies and show bottom line figures from implemented examples of the SSB system and show what the Navy is missing out on because of their policies, hopefully resulting in a change in policy direction, 2) since it has been shown (see Marketing Plan, Appendix D) that their policies are in conflict with the guidance documents and executive mandates, that a request for clarification be sent to Secretary of the Navy, Advocate for Competitive Environment and have NAVICP implementation policies reviewed for adequacy and possible revision, and 3) develop a mass broadcast to all PMO and provide them with intimate knowledge of the SSB system and specifically highlight the shortcomings of the NAVICP implementation policies. All three of these approaches are being undertaken at this time. With the completion of the Business Case Analysis (BCA) as a result of the SSB system implementation process for SSDS MK 1, we will have accurate real data to prove the viability of the SSB alternative and with that data we can approach NAVICP with a supportable and justifiable case in point. A set of

clarification questions have been prepared and is being sent to the point of contact in the SECNAV office to review our interpretations of the cause and effect impacts due to the NAVICP implementation policies. Articles are being prepared for three separate publications well read by our target audience: 1) The COTS Journal, 2) Defense Acquisition University (DAU) – Acquisition Review Quarterly, and 3) Defense Acquisition University – Program Manager, PM Magazine. Additionally several conferences and workshops have been or will be presenting the SSB system during the event and the presented materials will be contained as part of the proceedings. With regards to the long term mitigation of this treat, our plans are to: 1) Institutionalize the SSB system as a standard alternative by updating the DAU publication – Program Managers Handbook – to reflect the SSB system as the preferred practice, 2) keep vigilant with regard to the DMSMS community by providing presentations at future conferences/workshops, 3) provide face to face presentations to as many programs as possible, thus far over a dozen such presentations have been given, 4) present to the Program Executive Offices (PEO) and resource sponsors showing the bottom line benefits to get a top down endorsement/sponsorship.

Threat 2: Subcontracting government DMSMS support personnel to contractors creates a "conflict of interest" situation for the government employee while yielding sub optimal results for the Navy.

The primary purpose in implementing the SSB system is to provide the "best value" to the Navy through defining a process yielding manageable risks at the lowest LCC. If a "conflict of interest" situation exists either within the contractor - the bottom line versus "best value" for the Navy – or with the government employee trying to balance the requirements of – their employer directives versus "best value" for the Navy – the lack of independence of DMSMS support function will most likely produce sub optimal results for the Navy. Since the NAVICP implementation policies have no counter acting force or "change agent" activists, contracting out this vital function appears inevitable. Over time the internal Organic activities will become either the willing participants of the contractor's directives or a non-participant whereby the internal Navy resources for DMSMS support will eventually disappear. In the end the PMO (customer) will receive DMSMS support that will reflect the contractor's – "best bottom line" –

versus the Navy's – "best value". The same action plan identified for Threat 1 is applicable with regard to the "conflict of interest" issues although a few actions will require modification. With a "conflict of interest" problem the issues take on more of a political overtone versus the straight business implications in arriving at the "best value" for the Navy, as identified in Treat 1. Therefore it is important to work this issue in a low-key fashion up the chain of command instead of broadcasting it at every conference and workshop. The preventative actions to mitigate this treat are to confront NAVICP directly and request interpretation and action from SECNAV.

5. Contributions to Business Objectives

a) *Financial and Business Performance*

The implementation of the SSB process to the SSDS program has had positive impacts to both the financial and business performance requirements. The SSB process essentially provides an architecture that specifically addresses the issue of obsolescence, diminishing manufacturing sources, and material shortages. In this way the risk to the program is significantly reduced. The architecture provides effective coordination and networking leading to tremendous cost savings as well as the ability to ensure long-term supportability for COTS products. From a financial perspective, the SSB process allows for the opportunity to significantly reduce the upfront costs and stabilize the funding profile over the period of support leading to a much more efficient use of funds. This is in addition to sizeable cost savings and avoidance. From a business perspective, the overall awareness of obsolescence and material shortages gives the program manager more information for making effective decisions. Furthermore, the risk mitigation aspects of the SSB process come from establishing a collaborative environment where the responsibilities and risks are shared between the commercial and government activities. Out of this environment come positive business impacts in terms supportability, program planning, program risk and Life Cycle Cost.

b) *Strategic Positioning and Ownership*

The SSB infrastructure was implemented into the SSDS program. The overall environment is one of collaboration, coordination and trust. The functions are coordinated across a network of commercial and government activities. The expertise

from both the private and public sectors is shared across this network. This situation nurtures long-term relationships between the commercial entities and the DoD participating activities. These relationships are consistent with present DoD and industry partnering initiatives. This and the fact that the SSB process has provided tremendous cost savings to the SSDS program only strengthens the strategic position of the SSB system within the set of support alternative solutions presently available to the PMO. Furthermore, the mere fact that the PMO has discretion and authority to create an SSB environment, illustrates the control and ownership the PMO has in the face of COTS product proliferation. Remember, the COTS initiative essentially reduces the control the DoD has historically had over system design and support. The SSB process allows the Program Office to regain some control in that it extends supportability and maintains key technologies for stabilizing the system baseline.

c) *Operations and Functions*

Reviewing the benefits that are derived by implementing the SSB process, we immediately realize the positive effect it has on extending COTS product supportability for the SSDS program. Recall, that commercial product life cycles are typically 18-months to 2-years, whereas DoD planning and implementation easily exceeds 5 years. In this case the SSB process allowed the PMO to postpone likely redesigns that result from obsolescence. By extending supportability, the SSB process gives the PMO the opportunity to better forecast and react to changes in warfighter requirements as well as in the market. Overall management of the program is made more efficient given the extended timeframe for assessing technology trends and evolving warfighter requirements. By extending COTS product supportability, the PMO can now align technology refresh cycles with product end-of-production dates. In this case we are talking about the extended production of a specific COTS product by the Sunset Supplier. At the same time we can essentially compress the timeframe for delivering support to the warfighter. Sunset Suppliers take on the responsibility of stockage, storage, and issue of COTS replacement and repair parts. Improved delivery to the warfighter is expected since the Sunset Supplier can be contractually responsible for specific performance metrics if so stated in the appropriate documents.

d) *Product and Services*

With the implementation of the SSB process, key enabling technologies are retained through extended supportability over a defined period of time. The net result is a stabilized system performance baseline produces an overall improvement in terms of products and services. The SSB process allows the program manager to match the COTS product update cycles with the program's technical roadmap or refresh effort. Furthermore, as a product, the SSB infrastructure becomes part of a toolset that provides obsolescence indicators and reports as well as the ability to mitigate maintenance and supportability issues at the assembly level. This support strategy can now include a mechanism for establishing and managing the information obtained from the assessment and reporting activities, thus empowering the program manager with the knowledge necessary to deliver an improved customer service. In the long run the system integrity is maintained, which has several implications in terms of Integrated Logistical Support (ILS) (i.e. training, manuals, configuration control, Fleet training…)

e) *Image*

The financial and non-financial benefits derived and identified within this document prove the viability, effectiveness and value of the SSB system as an alternative to conventional support mechanisms such as "Life of Type Buy" (LTB). Not necessarily as a replacement for these traditional methods the SSB system supplements them as another option. The SSB process does not intend to extend supportability for the sake of retaining old technology, but rather to stabilize the system performance baseline for periods that can be aligned with DoD acquisition cycles. It offers an opportunity for the PMO to consider redesigns based on performance enhancements in response to evolving warfighter requirements rather than redesigns due to obsolescence. This mere fact makes this an attractive scenario from a PMO's perspective for improving life cycle management. And in conjunction with the significant cost savings the overall appeal of the SSB system should make it the alternative of choice for program managers seeking to optimize their support strategy.

6. Summary

The results presented within this document clearly illustrate that the SSB implementation has the potential to offer significant benefits to DoD Weapon System acquisition programs. Nevertheless, the results not only reflect an overall cost savings for the analysis period, they also provided further insight to other desirable benefits. In particular, risk mitigation and management was enhanced for the program manager. The SSB method had an extremely low initial investment as well as a profoundly stable funding profile over the defined support period. The low initial cost translated into less of upfront investment. The more money that is invested upfront, the more you are locked into a situation in order to derive the greatest return. For example, let us say that you purchase a million dollars worth of spares in the first year in an effort to support a particular product over ten years. After the first two years you use up $200K of the spares when you are presented with an opportunity to improve product support, reduce costs and/or enhance system capabilities. You still have $800K invested in spares. In this case you are unlikely to take advantage of this opportunity. Subsequently, low initial cost reduces the risk of staying the course and fully optimizing program attributes. Furthermore, in the situation where you have made significant investment in spares upfront, you are calculating this amount based on a forecast of failures for a particular item. There are two risks associated with this. First, investing too much means making purchases in spares that will never be used. Second, buying too little, runs the risk of not being able to support the weapon system for the prescribed period of support. Along with the low initial costs, the SSB method allows for even expenditures of the remaining funds. To whatever degree the SSB was implemented, the resulting funding profile was very stable. This stability is important to the planning and budgeting process. Effective planning and budgeting is essentially a process in risk mitigation, and anything we can do to help the planning and budgeting process helps us to reduce risk. Also, remember the very nature of the SSB infrastructure is a collaborative venture in which responsibility and thus risk is shared between the commercial and government entities, a further step in risk reduction. Furthermore, by stabilizing the funding profile we can make efficient use of funds, which is a recurring mandate throughout government acquisition directives.

The effects of SSB implementation have clear financial impacts, which are aligned with Federal and DoD initiatives, regulations and guidelines.

The financial aspects of SSB implementation are not enough to conclude it as a viable support solution alternative. Just because we can save money, we have to ensure that it meets the requirements of the program and ultimately the warfighter as well. The SSB process extends the supportability and reparability of COTS products. By establishing arrangements between Navy Activities/Resources, the OEMs and third party small businesses (Sunset Suppliers), we can provide insurance to the Program Office that a particular COTS product will be sustained for a defined period of time. In fact, delivery of the replacement spare is initiated at the time of failure in the Fleet. The COTS item is purchased on demand rather than upfront, which is based on failure rate data. If ten items fail over ten years, you will only purchase ten replacement items. This approach again is flexible and provides a mechanism for improving the planning and budgeting in support of the next tech refresh point. The extension of support stabilizes the system baseline so that a more focused approach is given to planning for future product or system redesign efforts. By stabilizing the system baseline for a defined period of time, we again reduce risk to COTS obsolescence during this period. In fact, the very SSB infrastructure facilitates effective obsolescence and material shortage assessment and reporting. This assessment capability is a coordinated effort across the SSB infrastructure. As the SSB is implemented on more programs membership in the SSB process grows allowing greater access to programs Navy-wide. In effect, the data collected in one program is likely valuable to other programs given the growing proliferation of COTS products in military applications. Therefore we visualize a process that is transportable, repeatable and expandable for all DoD/Navy programs.

As mentioned, certain strengths and weaknesses have been derived from actual implementation, business case analysis and environmental analysis. These strengths and weaknesses as well as the opportunities and threats, give great insight and decision-making power for focusing implementation activities into areas where the SSB is strong, and where the greatest opportunities lie. The information presented above, is pulled directly from Appendix D (SSB Marketing Plan), which also provides a path for

matching SSB strengths to its opportunities for enhancing SSB system capabilities in supporting the DoD Program Management Offices. This strategy improves the marketability as well as effectiveness of the SSB system. Additionally, Appendix D offers a plan for converting its weaknesses into strengths and threats into opportunities. Overall, based on the analytical results and guidance provided, a strong marketing strategy has been developed that is focused on capturing 20% of the market share for Navy programs by clearly establishing an image for the SSB system, through substantiated benefits, as the preferred alternative for the PMOs in supporting weapon systems that use COTS products. This strategy also emphasizes the ability of the SSB process to cost effectively insert technology into fielded Navy systems. A key element considering the transition to, and growth of, COTS products.

The results from the four deliverables have been melded together in this section in an effort to provide linkage and alignment across each step of the overall thesis approach. Many benefits have surfaced from each deliverable (see Appendix A – D) regardless of the approach taken. Also, unique strengths or benefits have been extracted from the collection of all the deliverables that show emergent properties not necessarily evident from any one approach, thereby yielding an important property of a "System of Systems". To this end, we see that each deliverable is capable of standing alone as a valuable entity for use in the decision-making process for SSB system acceptance and execution, but together they form a complete offering for effective and successful SSB implementation.

V. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

1. General

This paper has demonstrated that the SSB system is an affordable approach for managing and mitigating program supportability risk due to COTS products. As a collaborative system, the information that is derived from the identification and mitigation of risk is quantifiable and will be readily accessible to all SSB team participants. The process takes into account the fact that the supportability of fielded hardware is defined by the warfighter. The SSB system extends the life cycle and supportability of COTS and ensures a late-life cycle supply source. In so doing, the SSB permits DoD to be successful in leveraging commercial developments with appropriate economies of scale in order to reach its military performance goals while offsetting the problem of diminishing material.

The SSB system assists the Program Management Office (PMO) by providing infrastructure support to existing platforms/combat systems. When implemented early in the development process, the SSB process has been demonstrated to extend COTS products availability to support existing weapon systems; thus providing significant reductions in program risk related to COTS and life cycle management. The SSB provides predictive, “decision quality” information for PMO decision-making processes. The outputs of trade-offs and assessments accomplished as part of the SSB system will gain the PMO a high level of confidence with the warfighter/customer. The process is applicable to various DoD entities and their business, contract, and support strategies. When aggressively integrated across DoD, COTS product commonality will lead to flexible Integrated Logistical Support (ILS), thus providing incentives for the commercial industry to develop long-term relationships with the sponsors and users.

The SSB is sensitive to proprietary design rights and provides a proactive forum for contractual negotiations. The method employed, improves the detection of product supportability problems and provides sufficient time for analysis of alternatives and solutions in the decision-making processes. This technology assessment can be

implemented at the piece part, lowest replaceable unit, subsystem or multiple platform level. The SSB approach is to procure assemblies when the customer requires them. In this way, it achieves significant and quantifiable cost savings over the product life cycle. The process provides cost structures that track and continually assess progress over the entire product life cycle. This information permits informed decision-making contributing to life cycle cost savings without the need for Life of Type Buys at the assembly level.

Use of the SSB system improves schedule flexibility by providing support options that can be tailored for the activities needed and the warfighter. It reduces provisioning timeframes and places the responsibility for stockage, storage, and issue of COTS spares and repair parts on the supply contractor. SSB enables many support activities and functions: immediate supportability for Fleet returned failures, elimination of government inventory stock levels, large commercial distribution systems, no source inspection, commercial packaging, fast and direct delivery to the warfighter, and warranty of components. The SSB process has definable and repeatable characteristics that provide a comprehensive and flexible solution to supporting fielded hardware. It provides programs with an independent utility for implementing COTS products and has minimal or no impact on system operational performance. Once implemented, the SSB is an affordable, expandable, repeatable and reliable process that will meet the users performance expectations. It provides the best of both worlds. It leverages the inherently governmental functions of the Navy supply process and coordinates with commercial supportability assets through a thoroughly meshed and maintainable communication network solution.

2. Impacts to Problem Statement

The overall acquisition of military weapon systems is a challenging endeavor to say the least. One thing that has been reported, and confirmed in the business case analysis, is that procurement costs make up more than half of the acquisition costs. In fact, the procurement costs incurred after a system has been fielded still accounts for the majority of the life cycle costs. This scenario has lead DoD to begin leveraging commercial standards, products and practices in an attempt to lower risk and life cycle

costs. The use of COTS products has made great strides to reducing initial costs while transferring state-of-the-art technologies to the warfighter. However, these gains have come with their own set of problems. Given the mission criticality and software-intensive architectures of present weapon systems, slight changes in COTS products are simply unacceptable. Minor changes to a piece of COTS hardware can have serious implications to readiness and program costs, given their software intensive nature. It typically takes a significant effort, in terms of time and money, to develop, test and deploy upgraded changes. To further, complicate the issue, these weapon systems are developed and deployed in small quantities making them unattractive for typical commercial business interest. The uniqueness of these systems makes them difficult to support affordably. Given that commercial technology refresh cycles are around 18-24 months where the DoD can barely hope to refresh every 5-7 years, there is little incentive for major equipment manufacturers to continue production of a product that no longer fulfills their business objectives just for the sake of accommodating the military, which makes up less than 0.4% of the market. There is really only one of two ways to handle this dilemma. Either accelerate the acquisition phase, which is highly unlikely given the conservative DoD acquisition approach, or extend the supportability of the COTS products. Additionally, as the commercial content within military systems increase, the issue of COTS product supportability is complicated by orders of magnitude. Consider for a moment the eventual increase in technology refreshes needed across the DoD/Navy program spectrum as a result of the tremendous proliferation of COTS in military applications. This increase makes the issue of COTS supportability a major concern during acquisition and support strategy development. For program planning and budgeting purposes a mechanism is needed to effectively assess the COTS product supportability position for a particular program. To this end, the SSB system provides a support recommendation process for each COTS product in the weapon system under analysis. This approach assists the program manager in making decisions that will impact life cycle costs of the weapon system while meeting technical design requirements. From a planning and budgeting perspective it provides higher confidence in future program cost predictions. The output of the SSB process helps program

managers map proposed technology updates to system deployment, operation and support plans.

3. Impact to Acquisition Strategy

SSB Implementation efforts and the subsequent Business Case Analysis have demonstrated that the SSB infrastructure is an affordable approach for mitigating program supportability risk due to COTS products. The Marketing Plan emphasizes the collaborative nature of the SSB process to leverage the various areas of high performance and ability residing in the government, big business and the small businesses. From an acquisition standpoint, the COTS product risks are quantifiable and shared across the infrastructure. The SSB process was conceived for, and therefore sensitive to, the supportability of fielded COTS products as defined by the warfighter. As an acquisition strategy it extends the life cycle and supportability of COTS and ensures late-life cycle supply support. The SSB process essentially permits the DoD to be successful in leveraging commercial developments with appropriate economies of scale in order to reach its military performance goals while offsetting the problem of DMSMS.

The SSB infrastructure directly supports existing combat/weapon systems. In this way it provides the Program Office an additional support solution alternative. This alternative can be implemented early in the acquisition process to optimize the value and viability of COTS product usage. The SSB process can also provide insight to the supportability of selected COTS products early enough in the acquisition process to significantly reduce program risk related to COTS and Life Cycle Management. Additionally, when applied to various DoD/Navy programs, COTS product commonality could lead to a flexible, ILS approach. This scenario would likely have a ripple effect that provides incentives for the commercial industry to develop long-term relationships with the respective Program Offices.

The essence of the SSB process lies in its ability to detect potential supportability problems. By extending the supportability, it provides sufficient time for analysis of alternatives and solutions in the decision-making processes. Furthermore, accurate assessment of COTS supportability can be accomplished at any level (subsystem, equipment, component, or piece part). This approach not only extends supportability but

reparability as well. The SSB approach is to procure assemblies when the customer requires them. To this end, the SSB process is committed to continual assessment over the entire COTS product life cycle. Again, this approach breeds a more informed decision-making process translating to improved support performance and lower life cycle costs.

Overall, the SSB process becomes an additional and likely the preferred support solution alternative for PMs who will welcome the schedule flexibility provided by the SSB process. The flexibility comes from the fact that the SSB infrastructure can tailor the support options in terms of functions and expectations demanded by the warfighter. These functions include immediate supportability and fast, reliable and direct delivery to the warfighter. The COTS product supportability assessments are critical to effective SSB implementation and therefore a great deal of emphasis is placed on the collection, maintenance and dissemination of the information and knowledge derived.

B. RECOMMENDATIONS

DoD has recognized that product support solutions can be more effectively designed and implemented if the acquisition and logistics communities work in partnership. Within the SSB infrastructure, integrated acquisition and logistics functions conduct supportability analysis as an integral element of the systems engineering process. This process (SSB) should occur at the beginning of program initiation to ensure designed in reliability and maintainability throughout the program life cycle. This will also to ensure that the system performance baseline remains unchanged therefore continuing to meet the warfighter's supportability requirements. Although applicable at any phase of the acquisition cycle, it is critical to consider the SSB implementation in the earliest possible stage to gain maximum benefit. Consider the *SSB Only* support scenario developed in Appendix C (The Business Case Analysis). This scenario essentially employs the SSB method for all COTS products. The *SSB Only* method illustrates a situation where SSB was implemented prior to other support method choices and subsequent commitments. In this case we saw the greatest stability in the funding profile and the lowest initial investment amount. Together they result in the lowest risk to the program while providing more flexibility and sustainment capability.

The SSB process should be a continuous process. COTS product supportability assessments should be repeated frequently throughout the acquisition cycle. This approach not only keeps the data stored on COTS products fresh, but also allows for some maturation of the process. The idea is a continuous improvement environment that will ensure that the most cost-effective methods of support are being considered and subsequently offered to the PMOs.

The program manager is expected per DoDD 5000 to use the most effective source of support that optimizes performance and lowest life cycle cost, consistent with military and statutory requirements. The source of support may be organic or commercial, but its primary focus is to optimize customer support, achieve maximum weapon system availability at the lowest Total Ownership Cost. At their disposal, the program manager has a set of support methods that can be used to achieve this objective, the SSB process, as proven in the Business Case Analysis to be a viable and effective support method, and should be included as an additional support solution alternative in the solution space

VI. RECOMMENDATIONS FOR FUTURE RESEARCH

The SSB system was developed as a contemporary solution in addressing the COTS supportability risks as used in the Navy's combat and support systems. The assumptions, which underpin the system are relevant today and may or may not be relevant in the future. These assumptions are linked to many facets of the Naval support structures, such as: the supply system, current guidance and mandatory policies, business and programmatic infrastructures (i.e. PPBS, ORDALT scheduling, etc.) When changes occur in any of these support structures a direct or indirect impact to the SSB system may occur. Therefore it would be prudent to revisit the utility and viability of the SSB system in its entirety as a future research area.

The SSB system development process has matured to a point where emergent properties and new capabilities are evident and available for exploitation, however the system development process stopped short from optimizing the processes. The SSB system is developing into a stable process and producing standard data sets. We recommend that a systems optimization process be attempted for future researched as a continual improvement to the current SSB system practices.

Time will be arbitrator in evaluating the adequacy of the SSB system development process and the products produced by that system. Providing that the system exists long enough to produce an adequate amount of information and products, it is recommended that an independent review and analysis be accomplished to provide a critical review of the entire system to assess the value proposition as claimed by the system provides the Navy the "best value" alternative for COTS supportability and if the system could use some improvement or if the system has outlived its usefulness.

The SSB system was specifically developed to address COTS products that are microprocessor based products. Many of the base tools, practices, methods, and algorithms used in the system are based on the electrical commodities group, which is appropriate when addressing the combat weapon and associated support systems. However, other commodity groups such as mechanical, plastics, chemical, optical, and

ceramics groups have the same issues of obsolescence and DMSMS as does the electrical commodity. We recommend that future research be done to evaluate the transportability of the SSB system processes, methods, and approach to meeting the Navy's needs in obsolescence and DMSMS created from other commodity groups.

LIST OF REFERENCES

1) NIH. National Institute of Health , "Overview of the Government Performance and Results Act," http://wwwoirm.nih.gov/itmra/gprasum.html Retrieved on [June 2002].

2) Clinger-Cohen (1996) Information Technology Management Reform Act of 1996 (Division E of Public Law 104-106). It became effective August 8, 1996. Also known as the Clinger-Cohen Act. Retrieved on [June 2002]. http://wwwoirm.nih.gov/itmra/itmra96.html

3) OMB (2000) Office of Management and Budget, Circular A-130, Transmittal Memorandum #4, dated 11/28/2000, "Management of Federal Information Resources" (MFIR), Retrieved on [June 2002]. http://www.whitehouse.gov/omb/circulars/a130/a130trans4.html

4) DAU (2001) Defense Acquisition University, "DMSC Risk Management Guide for DoD Acquisition", Fourth Edition, February 2001, Chapter 4, Retrieved on [June 2002]. http://web.deskbook.osd.mil/reflib/DDoD/001EC/005/001EC005DOC.HTM

5) OSD (2001) Office of the Secretary of Defense, "Public-Private Partnering for Depot Level Maintenance", July 2001, p. I-1

6) OSD (2002) Office of the Secretary of Defense "DAU Program Managers Toolkit", Eleventh Edition, Version, 1.1, April 2002, p.40

7) Hartshorn, W.T. (2000). "Obsolescence Management Process as a Best Practice." In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/ .

8) McDermott, John T. (2002). "Reducing the Impact of Obsolescence in Military Systems." In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

9) Glum, Ted (2000). Support for the Warfighter. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/ .

10) Robinson, David G. (2000). DSCC DMSMS Management. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/ .

11) Osmundson (2001) PD-21 Systems Architecture, Spring Quarter 2001, Prof. John Osmundson's Lecture Notes

12) JALB (1999) Joint Aviation Logistics Board, "Commercial Support of Aviation Systems", June 1999, Section VIII

13) QDR (1997) Quadrennial Defense Review, TRANSCRIPTS: Hearing of the House National Security Committee: Chaired by Representative Floyd Spence. Witnesses: Secretary of Defense William Cohen, Joint Chiefs of Staff Chairman John Shalikashvili, May 1997

14) Augustine, N. (1994), *America's High Noon Complex*, Army RD&A Bulletin, September-October, 1994

15) FAR (2002) The Office of Federal Procurement Policy. AcqNet website for Federal Acquisition Regulations. Subpart 12.2. Retrieved on [June 2002] http://www.arnet.gov/far/farqueryframe.html

16) NAS NAVSEA (2002) Naval Audit Service "Contractor Logistic Support at the Naval Sea Systems Command", Report Number N2002-0049 May 17, 2002

17) NAS SPAWAR (2002) Naval Audit Service "Contractor Logistic Support at the Space and Naval Warfare Systems Command", Report Number N2002-0069 August 8, 2002

18) DJSM (2002) "Changes to the Requirements Generation System", The Joint Staff Memorandum, DJSM-0921-02 dated 07 October 2002.

19) Maier-Rechtin (2000) Maier & Rechtin, "The Art Of Systems Architecting," 2nd Edition, CRC Press, copyright 200

VII. ENCLOSURES:

The nature of the SSB thesis topic and the approach taken by the authors necessitated the use of examples, templates, tools, methods, and practices. These implementation tools and deliverable products are illustrated through a set of enclosures referenced in the thesis and its appendices. Most of the enclosures are static examples generated during the implementation of the SSB system on three Navy programs. However, other enclosures are not static and are therefore provided on a web site (URL: http://www.anavision.org/ssb.htm) in the Excel format to provide a dynamic model for use by an implementer of the SSB system.

1) Enclosure (1) Introduction to the Sunset Supply Base (SSB) System, initial presentation
2) Enclosure (2) Executive Summary - one page high-level summary
3) Enclosure (3) Article from the "COTS Journal", Volume 2, Number 7, January/February 2000, page 33
4) Enclosure (4) An example of a Statement of Work (SOW)
5) Enclosure (5) Provides a general fill-in-the blank template NDA form.
6) Enclosure (6) An example of the PMS 461 - SSDS COTS Working Group Charter
7) Enclosure (7) An example of the PMS 461 - SSDS COTS Working Group Management Plan
8) Enclosure (8) An example of a "Membership: Roles & Responsibilities Presentation" on the programmatic support team.
9) Enclosure (9) "Tasking Documentation"
10) Enclosure (10) Conference Paper -"Reducing the Cost of Ownership of Today's Weapon Systems Through the Extension of the Availability of COTS Electronics" by M Barkenhagen, S Cecil, R Cox, R Tadros
11) Enclosure (11) SSDS Project Plan - "Sunset Supply Base" Concept
12) Enclosure (12) SSB IPT "Mission & Vision"
13) Enclosure (13) SSB IPT "Roles & Responsibilities
14) Enclosure (14) SSB IPT "Norms & Ground Rules"
15) Enclosure (15) SSDS MK 1&2 prioritized, COTS list, early maturity
16) Enclosure (16) SSDS MK 1&2 prioritized, COTS list, Budget support
17) Enclosure (17) "17 Steps" - SSB Implementation Process
18) Enclosure (18) "17 Steps" - Step Definitions

19) Enclosure (19) Failure Rate Comparison Table, SSDS MK1
20) Enclosure (20) Number Of Spare Parts - Cost Justification Matrix
21) Enclosure (21) Technology Refresh Cost Model Demo
22) Enclosure (22) Requested Format for Parts Lists
23) Enclosure (23) Vendor Status Report
24) Enclosure (24) Obsolescence Health Report
25) Enclosure (25) SSDS Red Component List
26) Enclosure (26) Obsolescence Purchase Request email form
27) Enclosure (27) Obsolescence Impact & Purchase Request Report
28) Enclosure (28) SSDS Assembly Master & Cost Matrices
29) Enclosure (29) SSB Planning Excel Workbook & Data Item Description
30) Enclosure (30) Resource Cost Models

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APPENDIX A: SUNSET SUPPLY BASE SYSTEMS ARCHITECTURE

(This addendum was prepared originally for the purpose described below and required only minor adjustments for use in support of this thesis.)

PD-21 Systems Architecture Term Project
Spring 2001 Quarter
Prof. John Osmundson

SUPPORTABILITY INSURANCE FOR FIELDED HARDWARE
THE SUNSET SUPPLY BASE

By: Michael (Barky) Barkenhagen, Michael (Murph) Murphy,
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11 June 2001

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ABSTRACT

Acquisition reform and the policies that it invoked brought about the implementation of COTS. In analyzing the current situation, this paper reviews why the use of COTS was implemented, what the expected positive outcome was, how COTS fits into our national defense strategy, and what obstacles they pose in the context of warfighter supportability. Technology advances pose greater problems to Navy procurements than for consumer products. Components, sub-systems, and systems developed for the military have far longer lifecycles than their commercial and consumer equivalents. This paper provides a potential architectural solution to the obsolescence issues involving Commercial Off The Shelf (COTS) equipment and Diminishing Manufacturing Sources and Material Shortages (DMSMS). The focus of this paper is for Navy implementation of the Sunset Supply Base (SSB) architecture. The SSB supplier is envisioned to come from the smaller suppliers who, over the last three decades, have provided the DoD/government with high technology in custom products. Their role in this architecture will allow the DoD to extend the life cycle and supportability of COTS products and ensure a late-life cycle supply source. In so doing the SSB permits the DoD to be successful in leveraging commercial developments with appropriate economies of scale in order to reach its military performance goals while offsetting the problem of diminishing sources and material. Understanding that the end game of the system is to provide extended supportability of COTS products, the concept for this architecture can be stated quite simply: Provide appropriate incentives for the Original Equipment Manufacturer (OEM) to transfer their intellectual property rights to an SSB supplier for extended production in support of the Navy Program Management Office (PMO), and collaborate with the internal Navy resources to identify and mitigate risk. The architecture of the system is collaborative in nature and is defined such that it could be used by any DoD entity or associated allied / foreign military sales system. This paper demonstrates how the SSB architecture is an affordable approach for mitigating program supportability risk and details how the overall purpose is to provide dependable, cost effective supportability insurance for COTS based weapon systems.

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LIST OF SYMBOLS, ACRONYMS AND ABBREVIATIONS

1^{st} Piece	First Piece of Production
Act.	Activity
Assy	Assembly
BOM	Bill of Materials
COTS	Commercial Off the Shelf
COTS/NDI	Commercial Off the Shelf/Non-developmental Item
Devel.	Development
DMSMS	Diminishing Manufacturing Sources and Material Shortages
DoD	Department of Defense
ECP	Engineering Change Proposal
EOL	End of Life
FY	Fiscal Year
GIDEP	Government Industry Data Exchange Program
Govt.	Government
ID	Identification
ILS	Integrated Logistics Support
IPT	Integrated Product Team
ISEA	In-service Engineering Agent
LTB	Life of Type Buy
MIL-Specs	Military Specifications
MOA/U	Memorandum of Agreement/Understanding
MOE	Measure of Effectiveness
NAVICP	Naval Inventory Control Point
NDA	Non-disclosure Agreement
NMCI	Navy-Marine Corps Intranet
NSWC Corona	Naval Surface Warfare Center, Corona Division
OEM	Original Equipment Manufacturer
Part #	Part Number
P/N	Part Number
Parts ID	Parts Identification
PMO	Program Management Office
POM	Program Objective Memorandum
PR	Purchase Recommendation
QA	Quality Assurance
SSB	Sunset Supply Base
Sub(s)	Sub-contractor(s)
TOC	Total Ownership Cost
WWW	World Wide Web

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I. INTRODUCTION

This paper provides a potential architectural solution to the obsolescence issues involving Commercial Off The Shelf (COTS) equipment and their associated Diminishing Manufacturing Sources, and Material Shortages (DMSMS) risks. In analyzing the current situation, we reviewed why the use of COTS was implemented, what the expected positive outcome was, and how COTS fits with today's issues. The DoD design cycle tends to be long -- historically 10-15 years although today's goal is 5-7 years [4) McDermott]-- expensive, and usually resulted in out-of-date designs by the time production began. COTS products are driven by "Market Forces" and world wide competition, provide the DoD customer with several enticing advantages which were not previously available. The commercial world provides a quick response to changing needs, applications, and technology, while at the same time paying for development costs as part of doing business. COTS therefore provided DoD with a way to keep up with technology using the cost effective methods of large commercial entities (i.e., economies of scale, volume rate production, etc.) and implementing these new technologies in a timely manner. The flip side to the positive attributes is the fact that even slight changes to COTS hardware/software can adversely affect interfaces to other equipment. Fleet support for fielded systems raises problems in configuration control, and hardware and software compatibility. The associated ripple effects at the system level are major risks in maintaining Fleet capability and readiness.

There are many different strategies that could be used to solve availability problems, thus ensuring Fleet readiness. Which one makes the most sense depends upon a variety of factors. These factors are the results of the obsolescence risk health analysis, the plans and desires and schedule of the customer, engineering analysis, risk analysis, and a cost analysis (a cost for the solution scenarios using cost models).

The types of solutions to choose from can include one or more of the following:

- Bridge buys
- Spares utilization
- Maintenance Contracts with Vendors

- COTS/Non Development Items (NDI) replacement
- After-market

A bridge buy is a short-term buy solution to an availability problem. Items are purchased to bridge the time from some point before product obsolescence to a known point in time when a refresh/upgrade is planned. Often a bridge buy is performed while the logistics of the agreed-upon long-term solution become finalized for execution. In essence, a bridge buy should provide the customer some time by solving the immediate availability problem for a period of six months to three years. Bridge buys may be desired for many reasons: 1) inability to accurately assess and predict the lifetime demand, 2) inabilities to acquire funding for a Life-of-Type (3 to 10 year) Buy, (LTB) and 3) a redesign is the desired long-term solution, but budget constraints may delay the effort for a finite term. Guidelines for making the repair/replace decision should be as follows:

- If considering a bridge buy solution, high price items should be investigated for repair as opposed to a bridge buy
- If considering a repair concept, bridge buys should be estimated when the cost to repair is equal to or greater than the cost to replace.

Spares utilization may be an option to support the equipment until a refresh/redesign is planned. Typically such spares come from supplies maintained from the prime contractor, from the In-Service Support Activity, or from decommissioned assets tracked by Naval Inventory Control Point (NAVICP).

Maintenance contracts with vendors are utilized to deal with obsolescence instead of bridge buying an item. This method can be used to support products until a technology refresh and/or end of system life methods can be employed. This concept allows the delay of a technology refresh due to the repair capability after product obsolescence. In most cases, it allows the Program Manager to lower his support cost due to the cost of repair being less than the replacement costs. This philosophy contains some inherent risk associated with vendor's capability to repair and the repair support period the vendor is willing to sign-up for.

Two approaches can be taken for COTS/NDI replacement. For a minor impact solution approach, it is possible that the problem product is replaced by a newer revision of the same product or an entirely new product of the same family. The major impact solution approach consists of a technology upgrade change from the same vendor - or an entirely new product and vendor. Low complexity and cost products (Type A) will usually fall into the first solution approach category (newer version of the same product). This type of replacement produces a minimum impact on the system. Moderate complexity and cost products (Type B) can cause a minimal impact and need to be investigated on a case per case basis. Both A and B types require an Engineering Change Proposal (ECP) Type II; however, the additional costs incurred by the ECP process should be taken into account. High cost and complexity products (Type C) will usually cause a major impact, requiring a class I ECP with associated processes, approvals, and costs. The program has the associated risk of impacting the interoperability of the system using either solution.

The after market approach, referred to in this paper as the Sunset Supply Base (SSB), extends the supportability of COTS products and items of material shortage predicated on the needs of the Navy programs. The SSB is an extension of product availability, beyond the Original Equipment Manufacturer (OEM) assigned date to drop the products as obsolete items. This approach provides stability to the system baseline configuration over a defined period of time between scheduled Technical Refresh/ Insertion points. The goal of the SSB architecture is to define an arrangement where the Navy leverages large businesses in their strong suit of technology, market leader, and quantity in manufacturing, and utilize the small businesses for their strong suit, namely: agility, small run production, and long term partnership. To bridge the gap between the commercial world's OEM business planning and the Navy's need for long term support, a third party is brought in: the Sunset Supplier. The Sunset Supplier is usually a small business unit. The Sunset Supplier establishes a contractual relationship with the OEM to produce the obsolete products for the OEM customer base, in this case the Navy and it's associated contractors. The OEM transfers the intellectual property and assembly expertise to the Sunset Supplier, and for this, the OEM receives royalty on the sale of all

products produced. Internal to the Navy are support infrastructures to ensure supportability of Sunset products by mitigating any component part obsolescence or shortages issues if they exist on those products. The infrastructure and support of the SSB process yields not only significant cost savings, but also provides other benefits, such as:

- Supportability of products defined by customer needs over 5, 10, 15, or 20 years.
- Life Cycle cost savings, due to no lifetime buy at the assembly level is needed, so the assemblies are procured, as the customer requires them.
- Reparability of assemblies over the designated Life Cycle (5, 10, 15, 20 years).
- Hardware/Software/Firmware stability between Technology Refresh/Insertion Cycles.
- Significant reduction in Program risk as related to COTS and life cycle management.
- Improved schedule flexibility and support options that can be tailored for Fleet needs.
- Minimal or no impact on system operational performance and the user. The performance will remain constant using exactly the same part: form, fit, and function replacement, which have been made by the alternate manufacturer, the Sunset Supplier.

The proposed COTS SSB system provides an opportunity for a triple win situation involving all entities. The COTS OEM wins because they can claim long-term life-cycle support of fielded products at lower costs and less impact during implementation on current and future systems. The OEM may also ask for compensation/royalties for each item sold. The COTS Sunset Supplier wins in terms of new customers, new product lines, and building long-term relationships with the user community. The Navy wins by obtaining long-term supportability, maintainability and operational readiness. Program Management (PM) can optimize upgrades, re-designs, technology refresh intervals, etc. Program management can also help expose piece part obsolescence problems and shortages before they affect the COTS Sunset Supplier through the use of a qualified independent third party manager and COTS cross-

functional technical support team. Defining the role of the DoD community will be critical in assuring the long-term objectives in Fleet operational support.

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II. SYSTEMS ARCHITECTURE ANALYSIS

A. NEED

Acquisition Reform and the policies that it invoked brought about the implementation of COTS. Those policies encouraged the avoidance of unique requirements, restrictive statements of need, and detailed specifications. Together with DoD 5000.2 and the Federal Acquisition Regulations, DoD hoped to leverage the large businesses in terms of state-of-the-art technologies and quantity of manufacturing in order to provide state-of-the-art technology at lower costs. COTS technologies are driven by industry, and the COTS manufacturers are driven by their customer base of which the DoD only makes up approximately 0.4%.[1) Glum, 2) Robinson, 3) Hartshorn] To hold a place in their market, COTS manufacturers must remaine competitive, which means a continual push in the development and use of technology. It is this intense competition that drives the fast technical update cycles and ultimately influences technology change and direction. To this end, the COTS manufacturer's position in the marketplace is dependent on the company size and its technology edge. These factors impact the direction and update cycles of technology and the products that employ them. Therefore the COTS manufacturers hold a significant place in weapon system development and manufacturing because they can effectively facilitate the quick response to DoD changing needs.

Typically the DoD design and develop cycles span 5 to 7 years (10-15 years historically)[4) McDermott] and are expensive and often deploy out of date equipment. COTS manufacturers on the other hand take a big business approach in offsetting development costs through economies of scale and volume rate productions. Therefore, they can effectively implement technology change in a much timelier manner. Through the Acquisition Reform Initiatives, DoD is encouraged to capitalize on these big business characteristics and allow industry to be burdened with the technology development costs. The expected result for the DoD is lower overall developmental investments and an

opportunity to be able to synchronize their design efforts with state-of-the-art technologies.

The widespread use of COTS in military weapon systems does however bring certain challenges. Nothing is as easy as it looks. There are serious obsolescence issues associated with the use of COTS, as well as other material shortages issue. The challenge is to provide life cycle support of fielded systems that use COTS products as part of the system's critical components. The life cycle for some military weapon systems may exceed 20 or 30 years. This is not at all consistent with big business timelines, and there is presently no incentive for COTS manufacturers to continue production of DoD COTS products on a small scale. The driving force here is the market driven rate of technology change in the commercial world. In the commercial world technology updates occur over an 18-month to 2 year cycle.[1) Glum, 2) Robinson, 4) McDermott] By contrast, the DoD experiences technology refresh cycles between 5 and 7 years.[4) McDermott] This cycle is impacted not only by software and hardware updates but by programmatic schedule changes as well. The challenge is further exacerbated by how the military will continue to develop weapon systems that do not fall prey to technology that will not last or technology that will undergo significant change.

Technology changes will occur in the COTS arena and will have direct impacts on military weapon systems existing and even those under development. Slight changes in software could have devastating effects. Quite often systems are built around software which means systems architectures are dictated by software and slight software changes will likely have significant cost impacts. Relatively small software changes could have very expensive consequences. To expound on the implication of software change impacts, we need to understand that software may not only dictate certain standards, but that software changes occur fairly regularly in the commercial world and re-integration is difficult and expensive. The DoD has to be aware of the impacts to hardware due to software changes. Likewise, slight changes in COTS hardware may impact software applications. Additionally, there could likely be impacts in terms of interfaces with other equipment or systems that may not be so apparent. Subtle specification changes to COTS hardware (i.e. timing, execution…) could have devastating ripple effects. These negative

effects will be at the system level and will substantially increase the risks associated with using COTS in the future.

Since military weapon systems are typically unique, the use of COTS becomes a tricky business in terms of dictating system design and ultimately life cycle support. In terms of software, military applications tend to be very specific, and the weapon system cannot tolerate or support changes. Compatibility and configuration-control become crucial elements for both software and hardware. Support activities are pressured to maintain stabilized baselines in order to keep the certification of the system verifiable. These include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc…).

To fully understand this issue of support, we must revisit certain DoD characteristics. Military acquisition is characterized by high development costs and very long development cycles; therefore military procurements are forced to project future needs and purchase as many products or components as they think they will need. Furthermore, in light of unique military applications, the lengthy life cycles and the 5 to 7 year technology refresh rate, the DoD realizes that they presently have no control over product evolution, and therefore must compensate by staying aware of pending changes. This is critical if the military is to expect any appreciable success in support of their weapon systems. Operational and maintainability support is expected over the entire life cycle of the system. This includes support for design and development efforts as well. As mentioned previously, DoD design and development cycles spanning 10 to 15 years, are expensive and often deploy out of date equipment. These design and development activities must rely on commercial products to be available when the design goes into production. Furthermore, production and manufacturing facilities must rely on the source of supply in producing the systems they were contracted for, which will include commercial products that contain their own supportability issues.

The impacts of ineffectiveness to support our weapon systems throughout their life cycle will be realized in military readiness and capability. When we consider the huge investments that DoD makes in getting technology to the warfighter and training

our warfighter, support of our weapon systems should not be the weak link in maintaining high levels of combat readiness and personnel safety. This weak link might be the result of the ever-increasing pressure to reduce costs. Very often we hear of cost as the independent variable in design and development efforts and that total ownership costs should be factored into the design process. To do this the design activities must maintain a holistic perspective of the system to include life cycle support of technologies that have been selected for insertion into their weapon systems.[5) Osmundson] With the challenge of reducing costs and effectively supporting the warfighter, today's systems architects for DoD systems must understand what drives cost in order to carefully consider alternatives for life cycle support.

The cost associated with supporting weapon systems throughout their life cycle is perhaps most sensitive to the availability of components that are needed to maintain stability in the operational context. As legacy systems age, their associated support and maintenance costs rise dramatically due to obsolescence, reliability and supportability problems while at the same time the performance of the system decreases. As original equipment manufacturers synchronize their product lines with technology, products presently deployed in DoD weapon systems, as well as products intended for use in developmental systems, will be affected. Alternate components or parts will need to be considered for acceptance or rejection. There will be material shortages occurring because of the social, economic, and political environments. In either case there will be costs associated with these decisions and cost must be managed effectively. If the alternate part is accepted, an engineering change proposal will need to be initiated. There is cost associated with preparation, coordination, scheduling and testing of the alternate part. If the alternate part is unacceptable, large product buys will be needed to ensure operational integrity and support of the system over its life cycle. There is cost with developing a new source of supply. In these cases there are issues of where to buy, how much to buy, where to stock them, and how to manage the costs and logistical support to meet the needs of the customer.

Understanding costs will help government activities meet the needs and desires of the customer, mainly in assuring life cycle support of COTS. More specifically, we need

to extend the supportability of COTS since we know that the life cycle of many weapon systems exceed the life expectancy of the COTS used. By addressing the supportability issue we effectively address a much deeper need, that is warfighter readiness and capability. By assuring COTS supportability through the system's life cycle we can consequently ensure reasonable combat readiness and capability status. In essence we need to provide stability in terms of baseline configuration of the weapon systems that use COTS in order to support the periods of time between technology refresh cycles. That is to say there is a compelling need to improve the supportability of fielded products for the period necessary to meet the user requirements. In satisfying this, it must be cost effective at the initial procurement, over the life cycle of the system, and ultimately provide the lowest possible impact to Total Ownership Cost (TOC). This will involve a predictable and sustainable process for support of fielded and developmental systems. To be successful, this process will need to adequately identify risk, mitigate those risks, and provide resolution methods and planning. Knowing now that a new architecture is needed to meet these needs we must conclude that a departure from traditional methods is necessary to meet the challenge of sound planning and careful tailoring of COTS acquisition at the lowest possible cost.

Reduced government funding and manpower levels have further emphasized the need to improve life cycle management processes. Perhaps the focal point for this effort is COTS risk mitigation during development and for fielded weapon systems. This type of continual assessment is needed to offset the fast technology update cycle experienced in the commercial realm. This will provide system baseline configuration stability and supportability. Key to this is the need to continually assess original equipment manufacturers. This assessment should provide valuable insight to the vendor's stability, which in turn impacts the level of risk associated with specific components employed by the DoD. Such assessments would perhaps look at how limited a vendor's product line is and/or make judgments on the potential of specific products in that line to change or disappear. To this end, it becomes important to determine the likelihood that a vendor will continue to provide DoD assets and the consistency of that product line. The challenge is in the architecting of a process that is proactive, disciplined and systematic,

and will consider and address the needs as discussed here for the intended audience. The audience being those customers or stakeholders whose needs must be fulfilled.

The **customer** in this case takes on many dimensions.

The End User - Certainly the end user must be considered for it is the end user we depend on to operate our weapon systems and provide the expected defense as defined in our national strategic policies.

The Program Management Offices (PMO) - This includes the initial acquisition community whose purpose is the acquisition of new systems. They also support the in-service engineering activities that must continue to procure parts as part of an alteration kit or on-going support for the warfighter, including repair and replacements of parts. They support the integrated logistical support functions, which must plan the long-term support of fielded equipment and must support equipment between changes to the equipment base line. One of the PMO's primary responsibilities is budgetary support for personnel who must project the availability of products that extend over the 2-year Program Objective Memorandum (POM) cycle and the 3-5 year implementation cycle. Additionally they must fund support military field activities or service contractors who prepare Cost, Health, and Risk models which quantify the availability and supportability of the fielded systems.

Interoperability Support Activities - These activities must obtain and maintain a stabilized baseline in order to keep the certification of the system verifiable. These support activities include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc.).

Design and Development Activities - These activities must rely on commercial products to be available when the design goes into production.

Production/Manufacturing Facilities - These facilities must rely on the source of supply in producing the systems they were contracted for, which will include commercial products that contain supportability issues.

B. PURPOSE

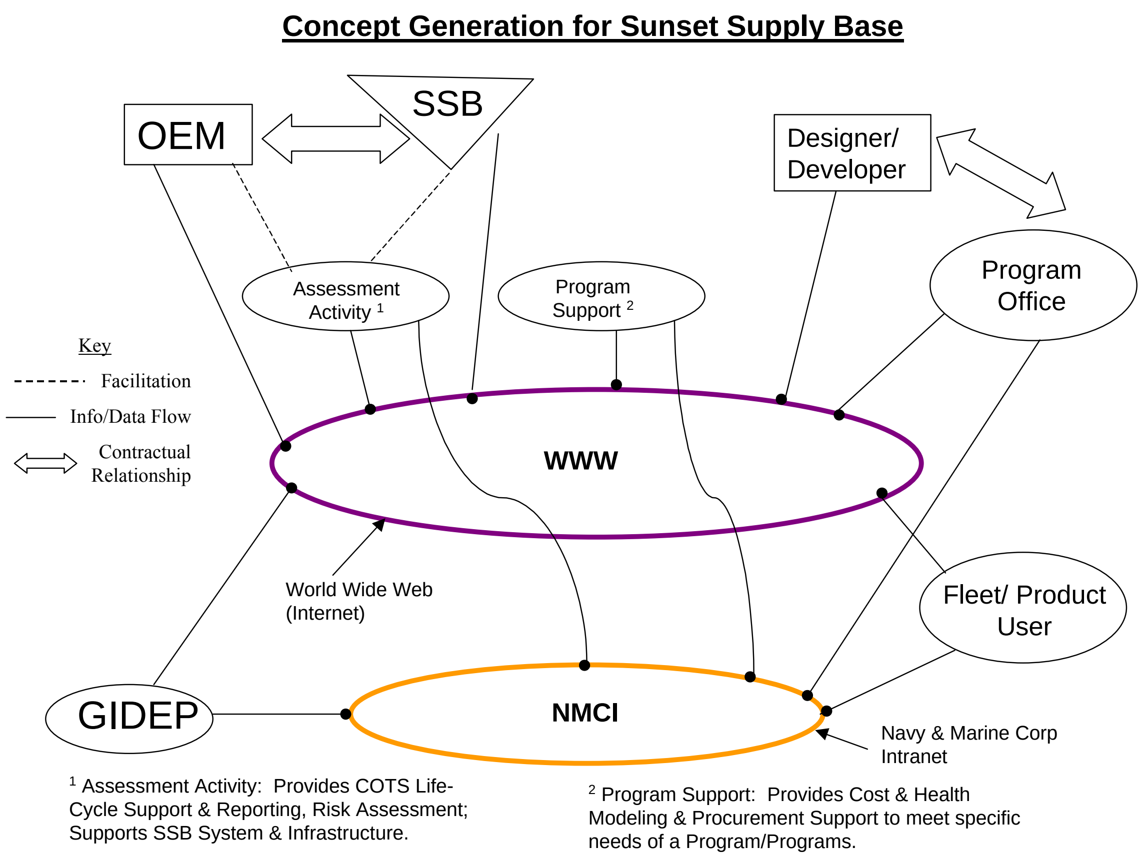
The overall purpose of the SSB system is to provide dependable, cost effective supportability insurance for COTS based weapon systems. The result will provide a solution to COTS obsolescence issues, material shortages issues, and extend the supportability of COTS components. The architecture should address COTS technology obsolescence management through product and technology obsolescence forecasting methodologies and provide a new process for managing changes with COTS based systems. The final architecture should respond to the voice of the customer, who is demanding credible combat power through design and supportability, by putting speed and agility into the process, and ultimately provide some value as perceived by the customers.

C. GOALS

1. Expectations

Understanding the needs of the customers we must now derive specific goals to meet those needs. In establishing these goals we must also relate them to our national defense strategy and acquisition policies. Therefore we understand the necessity for effective collaboration between the warfighter, the program offices, and private industry. To this end, we expect the architectural form of such a process will exhibit the characteristics of a collaborative system, which necessitates voluntary participation. Figure 1 depicts a conceptual illustration of such a collaborative system within the Navy for the Sunset Supply Base. This voluntary participation is needed for the assemblage and maintenance of such a system and is crucial to its success. Success will be measured continuously for those properties that emerge, against how well they fulfill the purpose and how well they are managed to accomplish their specified tasks. Through abstraction we can visualize a system that has very distinct elements that work together for mutual gain and to satisfy a common need. Therefore, we can expect that such a system should evolve from existing capabilities or systems. A complex system will develop and evolve within an overall architecture much more rapidly if there are stable intermediate forms.[6) Maier-Rechtin] Therefore, we can expect a period of time when experimentation is performed during which collaborative requirements are identified and

refined, and systems modified and/or interfaces developed to allow the required collaboration. By allowing the system to develop using such an evolutionary method we are taking, what some consider a spiral approach to system maturation, we can eliminate the need for development of high-level coordination, thus streamlining the process and insuring that the system fits the problem appropriately. This streamlining should provide stable intermediate forms that will be self-supportive technically, economically, and politically. By taking this approach all participants should derive some benefit that will foster long-term relationships.



Appendix A Figure 1: Concept Generation for Sunset Supply Base

2. Objectives

The DoD is looking to improve program supportability and extend COTS reparability for 5-7 years and beyond. They would like the ability to match COTS update cycles with program's technical roadmap/refresh efforts. To do this they will need insight

to potential obsolescence issues through predictive tools and be able to mitigate maintenance and supportability issues at the assembly level.

The COTS manufacturer needs to be aware of the enhanced product supportability benefits that will mean continued profits for their stakeholders. Their willingness to develop long-term relationships with the DoD is paramount for success. The DoD must encourage such teaming and still be able to offer protection for the COTS manufacturers' proprietary design rights.

One of the main objectives in developing such long-term relationships is to clarify the roles of all participants in the process. By doing this we need to establish specific interfaces, and these interfaces will have to be effectively managed to achieve efficiency and success. The greatest dangers are at the interfaces.[5) Osmundson, 6) Maier-Rechtin] Therefore we must pay close attention to the interfaces and understand why each entity participates and continue to provide incentives for continued involvement.

3. Specific Goals

The systems architecture shall have the following goals:

a) *To Be Able to Identify, Quantify, and Mitigate Supportability Risk to Programs.*

This process must be affordable and be able to successfully assess the cost savings attributed to the process. The information derived from identification and mitigation of supportability risk shall be quantifiable and readily accessible by participants.

b) *Extend the Life Cycle and Supportability of COTS.*

Supportability of fielded hardware shall be defined by the warfighter. The process shall take this into account as it defines the metrics for assuring late-life cycle supply source. To be successful the DoD shall continue to leverage commercial developments with appropriate economies of scale in order to reach expected military performance goals and still offset the problem of diminishing material.

c) ***Provide Infrastructure to Support Existing Platform/Combat Systems in Support of the Program Office.***

This goal is to provide infrastructure earlier in the development process to demonstrate and prove COTS components and to support existing weapon systems. This will provide significant reduction in program risk as related to COTS and life cycle management.

d) ***Achieve Significant and Quantifiable Cost Savings over the Product Life Cycle.***

Cost structures shall be tracked and continually assessed over the entire product life cycle. This will significantly impact the effectiveness of informed decision-making that is needed for success. The up front cost assessments will contribute to the life cycle cost savings, due to NO *lifetime buys* at the assembly level. The assemblies would be procured, as the customer requires them.

e) ***A Reliable, Affordable, Repeatable, and Expandable Process that meets the Customer's Performance Expectations (e.g., Accessible, Transportable, Maintainable, Predictable).***

The process shall have definable and repeatable characteristics in order to provide a comprehensive and flexible solution to supporting fielded hardware. It shall provide an independent utility (an alternative option for DMSMS/Obsolescence Management) for programs when implementing COTS products and whose solutions will have minimal or no impact on system operational performance.

f) ***Institutionalize Methods for Proactive Management of COTS Including DMSMS Issues.***

The institutionalization of these methods will require the development of non-standard Integrated Logistics Support (ILS) and contract strategies and implementation methodologies that will access the commercial support base. In doing this, the process must be sensitive to proprietary design rights and provide a forum for appropriate negotiations. The methods employed shall improve product supportability problem detection and provide sufficient time for appropriate decision-making processes to implement analysis for alternatives and solutions. Overall it shall provide aid to the

decision-maker by providing technology assessment and management guidance at various levels - piece parts, lowest replaceable units, units, subsystems and multiple platforms.

g) *A System that Leverages Navy and Commercial Supportability Assets and Provides a Networked Solution.*

The process must take advantage of inherently governmental functions for DMSMS Management at the various field activities and coordinate with the commercial supportability assets. This coordination must be embraced through a thoroughly meshed and maintainable communication network.

h) *Leverage across Government Programs with Extended Applicability through Contract Strategies, Methodologies, and Incentives to Entice Commercial Industry Participation.*

The process must be transportable in terms of its applicability to various DoD entities and their contract strategies. Aggressive integration of common components across DoD entities should lead to flexible integrated logistical support of COTS products and should provide incentive for the commercial industry to develop long-term relationships.

i) *Forecast Budget Requirements in Support of the Programs/War Fighter/Consumer.*

The process shall provide predictive information for the decision-making components of the DoD program offices. In forecasting budget requirements in support of programs/warfighter/customer the outputs from trade-offs and assessments must achieve a high level of confidence to the program office.

j) *Improve Schedule Flexibility and Support Options of System Upgrades or New Development Initiatives.*

The process should incorporate improved schedule flexibility and support options that can be tailored for the warfighter and the support activities needs. One of the main objectives shall be the compression of provisioning timeframes. To this end, increased responsibility on the contractor's part is assumed in terms of stockage, storage and issue of COTS spares and repair parts. The benefits that we will strive to achieve

shall include immediate supportability, elimination of government levels of inventory stock, large commercial distribution systems, no source inspection, commercial packaging, fast and direct delivery to the warfighter, and warranty of components.

B. CONCEPT

The utility in the development of a concept in the architecting process is to guide the transformation of the function of a proposed system into a usable, realizable form.[5) Osmundson] An understanding of the customer base and their needs identified in previous paragraphs helps in molding the conceptual model as shown in Figure 1. However, it does not enable a designer to realize the complete vision. Most of the functional pieces identified in the conceptual model already exist, but what is missing is a method to tie the independent systems into an interoperable "Systems of Systems" that will yield new and emergent properties which are greater than the sum of the independent systems capabilities. Additionally, the concept for a new independent system will be developed and folded into the "Systems of Systems" concept architecture. This new system is being developed to meet previously unmet needs and goals, identified in the customer needs and analysis. The co-development of these two entities (i.e., the new system and the "Systems of Systems") will be shown to be symbiotic in producing the desired emergent properties. Taking a holistic view of the concept development we (the Architects) employ the heuristic, which states "Design the structure with good bones" [6) Maier-Rechtin] and from our vantage point it means at least the minimum collection of bones to provide the new emergent properties.

Core to the conceptual development of our two separate systems is the method of planned development, which does not rely on a centralized design entity. Instead, the planned development of our systems will use a collaborative approach where its functions, emergent properties and even the way in which it is used will evolve over time. So, "What is a collaborative system?" Maier & Rechtin [6) Maier-Rechtin] define a system as a collaborative system when its components exhibit the following characteristics:

- Fulfill valid purpose in their own right, and continue to operate to fulfill those purposes if disassembled from the overall system.

- Are managed (at least in part) for their own purposes rather than the purposes of the whole; the component systems are separately acquired and integrated but maintain a continuing operational existence independent of the collaborative system.

Examples of collaborative systems include the Internet, electrical power systems, multinational defense systems, joint military operations and intelligent transportation systems. Maier & Rechtin [6) Maier-Rechtin] articulate the above systems are "collaborative in the sense that they are assembled and operate through the voluntary choices of the participants, not through the dictates of an individual client."

The collaborative development method was chosen to meet several of the needs and goals identified through our analysis. A major consideration impacting the developmental approach was the political environment with respect to the use and leverage of Navy assets in the performance of inherently governmental functions. The politics permeate through all our systems: from the top as "The Corporate Thrust," to the local politics at the field activities as " The Rice Bowl Mentality." In looking at the "Big Picture" our team uses the following heuristic as a guiding principal: "If the politics don't fly, the hardware never will."[5) Osmundson] Although we are architecting processes and methods, the statement holds equally true. Two heuristics that apply specifically to collaborative systems were added to keep the concept development on track:

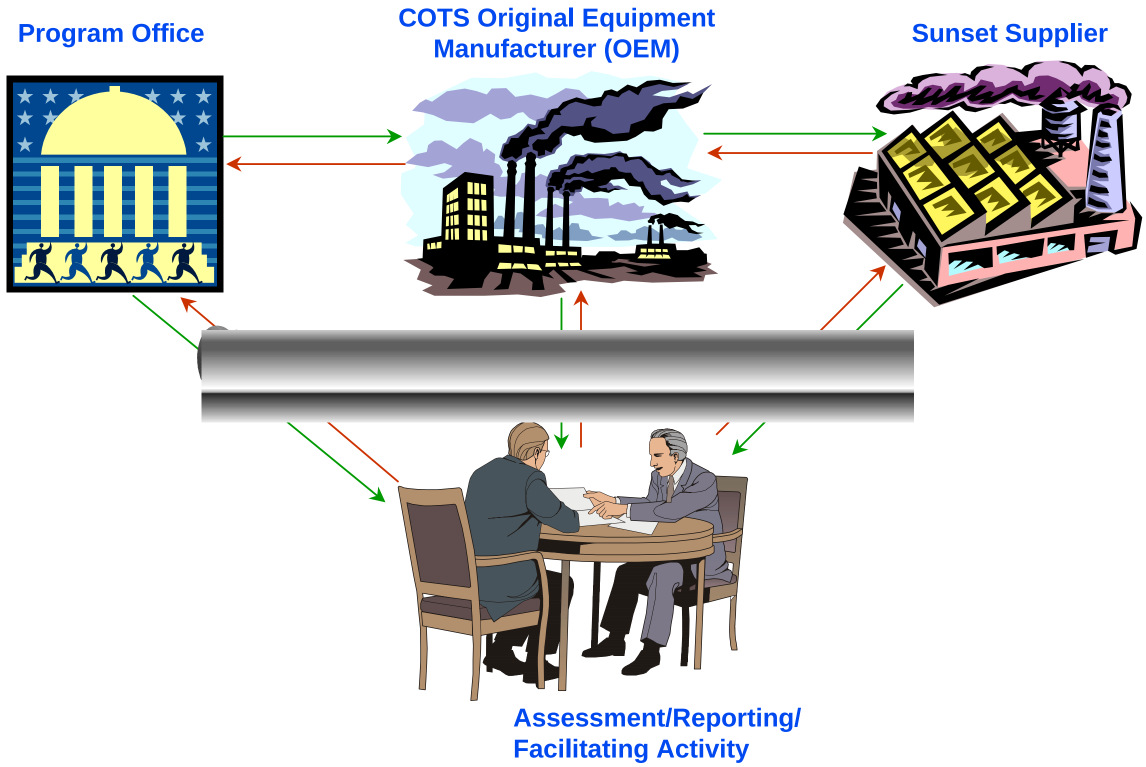
- The emergent capability is the whole point of the system; but the architect may only be able to influence the interfaces among the nearly independent parts, the components are outside the scope and control of an architect of the whole.[6) Maier-Rechtin]
- Consider a collaborative system a franchise. Always ask why the franchisees choose to join, and choose to remain.[6) Maier-Rechtin]

The concept model (Figure 1) illustrates the "System of Systems" developmental approach, which focuses primarily on the interfaces and the interoperability of the final system. The World Wide Web (WWW) provides the interconnection and connectivity between all available resources offering a broad scope of possibilities including Navy business that is carried out in the public domain. The Navy-Marine Corps Intranet (NMCI) provides another venue for the Navy assets to leverage each other's resources,

share sensitive data, and accomplish inherently governmental functions in a secure environment. One very important point to be made regarding collaborative efforts between the Navy Field Activities, the Fleet, and other Navy resources is that these efforts are not based on a zero sum end game. Specifically, the gain of capabilities by one field activity by using the collaborative system does not subtract capability from any other field activity, but rather what is really the gain is due to the emergent properties of the overarching collaborative system. The word "capability" is used as an example, we could just as easily substituted many other words such as funding, core equities, or resource allocation and the logic still applies. The system with its new emergent properties is meant to provide a "Win-Win" scenario.

The design of the new standalone system will also use the collaborative developmental methods, but the context is somewhat different. The context for the new system is the incorporation of the supplier base in the collaborative environment to design into the system long-term product supportability as an emergent property. As is apparent in Figure 2, the collaboration environment includes the following entities:

- Navy resource manager - Typically a PMO responsible for a system or systems that have supportability requirements over the equipment's life cycle.
- The Original Equipment Manufacture (OEM) providing state-of-the-art, high volume, short life cycle (~ 18 months), Commercial-Off-The-Shelf (COTS) products used in the Navy systems.
- The Sunset Supplier Base, which is a group of small, agile, customer-orientated companies with a proven track record in manufacturing performance in producing DoD products.
- The Assessment / Reporting / Facilitating activity whose primary role is in the development of the collaborative environment between all the entities, using networking, teaming, and partnering to stabilize the relationships.



Appendix A Figure 2: The COTS Collaborative Environment

C. FUNCTION & FORM, A COLLABORATIVE SYSTEM

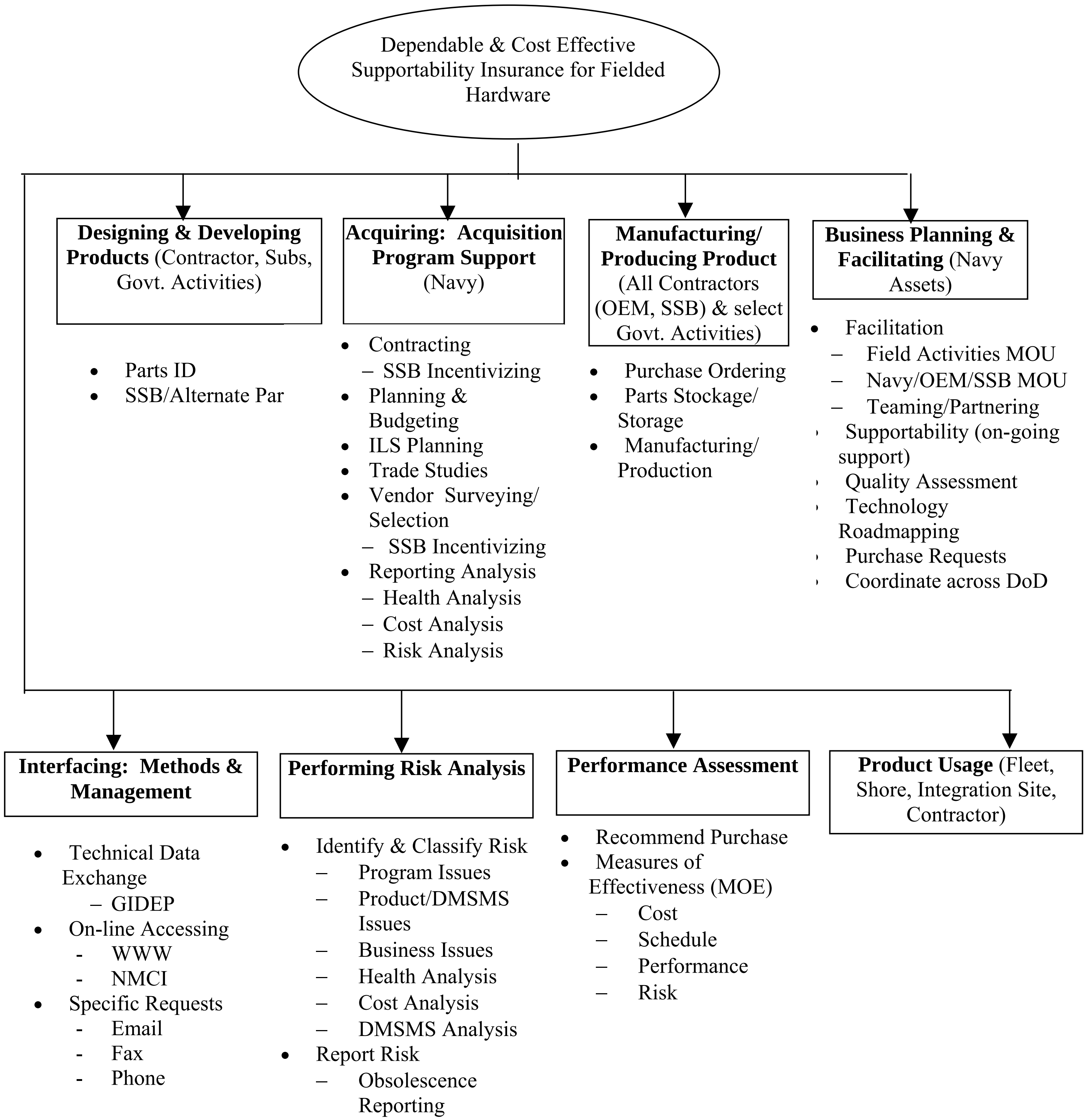
1. Overarching System

The collaborative approach identified in the "Concept" section provides the planned development based on the connectivity of existing systems with the addition of another independent system. In providing the connectivity, the relationship of Function to Form will identify the dependency and/or communication paths between various entities (Form) necessary in accomplishment of the tasks (Function). The primary differentiating or emergent property acquired through use of the new "Systems of Systems" construct is the leverage gained through information sharing. The functional decomposition as shown in Figure 3, identifies the primary functions of the overarching system, then details important sub-functions and identifies the relationship to entities, which currently perform those functions. Table 1 is a mapping of Function to Form and graphically illustrates the leverage to be gained through collaborative information sharing (an emergent property). Currently, very few of these entities are linked together, and no method or system is defined to accomplish this function. This relationship (Table 1) is

the first intermediate stable form for our “Systems of Systems” which will be added-on to, modified, and evolved over time. The overarching system once complimented by the SSB system must be compared to the initial goals to access the adequacy of the architecture in meeting the customer needs. Table 2 attempts to do just that, by graphically showing a link between the functions designed into the system and the goals of the customer described in Table 3.

2. SSB Standalone System

The planned development of the standalone SSB system, as stated earlier, is a collaborative architecture, and as shown in Figure 2 consists of several primary players. The Function and Form of each of these entities is already defined and all operate as an independent system unto themselves. Each entity may need to voluntarily adjust their functions slightly to accommodate the collaborative architecture, however most of the impacting change will be accomplished through the use of interfaces to each other and the interfaces to the overarching support system. The adjustments in function to make the system obtain its objectives and purpose are modest, and the interfaces between the entities are of the greatest concern. To explain each player’s accommodation and how the interfaces work, we will look at the proposed new system from the viewpoint of each player. Understanding that the end game of the system is to provide extended supportability of COTS products, the concept can be stated quite simply: Reward, through royalties, the OEM for transferring their intellectual property rights to an SSB for extended production in support of the Navy PMO, and collaborate with the internal Navy resources to identify and mitigate risk.



Appendix A Figure 3: Concept Generation & Functional Decomposition

CONCEPT	Form →	GIDEP	Design Activity	OEM	SSB	Program Support	PMO	Assessment/ Reporting Act.	Fleet
Function									
↓			(Designer/Devel.)	(OEM)	(SSB Contractor)	(NAVY)	(NAVY)	(NAVY)	(NAVY)
Design/Develop			X	X	X	X			
Parts ID		o	o	o	o	o			
SSB/Alternative Parts ID		o	o		o	o		o	
Acquisition							X		
Contracting			o	o			o		
Planning & Budgeting			o				o		
ILS Planning			o				o	o	
Trade Studies			o					o	
Vendor Surveying/ Selection			o	o				o	
Health, Cost, Risk Anal. Reporting								o	
Decision Making							o		
Manufacturing/ Production			X	X					
Purchase Ordering				o					
Parts Stockage/Storage				o					
Manufacturing/Production			o	o					
Business Planning						X	X	X	
Facilitation				o	o	o	o	o	
Supportability (on-going support)		o				o			
Quality Assessment			o					o	
Technology Roadmapping		o	o	o	o	o	o	o	
Purchase Requests			o	o		o			
Coordinate across DoD		o	o	o		o	o	o	
Interface: Methods & Management							X	X	
Technical Data Exchange		o	o	o	o	o	o	o	o
On-line Accessing		o	o	o	o	o	o	o	o
Specific Requests		o	o	o	o	o	o	o	
Risk Analysis								X	
Identify & Classify Risk			o	o	o	o	o	o	o
Report Risk		o						o	
Mitigate Risk		o	o	o	o	o	o	o	o
Performance Assessment								X	
Recommend Purchase								o	
Measures of Effectiveness		o	o	o	o			o	
Product Usage		o						X	X

Appendix A Table 1: Mapping Function to Form

The addendum contains the data dictionary for this table.

FUNCTIONS

GOALS (**See Table 3.)	Parts ID	SSB/Alternate Parts ID	Contracting	Planning & Budgeting	ILS Planning	Trade Studies	Vendor Survey/Selection	Health, Cost, Risk Analysis Reporting	Decision Making	Purchase Ordering	Parts Stockage/ Storage	Manufacturing/Production	Facilitation	Supportability	Quality Assurance	Technology Roadmapping	Purchase Requests	Coordinate across DoD	Technical Data Exchange	On-Line Accessing	Specific Requests	Risk Analysis (ID, Classify, Report, & Mitigate)	Performance Assessment	Recommend Purchase	Measures of Effectiveness	Product Usage
1.	X	X			X		X	X	X					X	X							X	X	X	X	
2.	X	X	X		X	X			X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
3.			X	X	X				X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X
4.		X		X	X	X	X		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X
5.				X					X						X			X	X	X		X	X		X	
6.	X	X		X	X	X			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
7.					X				X				X	X	X	X	X	X	X	X		X			X	
8.			X	X			X		X	X	X		X		X		X	X		X					X	
9.				X					X						X										X	
10.	X	X	X	X	X	X			X			X		X	X	X		X		X			X		X	X

Appendix A Table 2: Linking Goals to Functions

1	Identify, Quantify, & Mitigate Supportability Risk to Program
2	Extend the life cycle and supportability of COTS
3	Provide infrastructure to support existing platform/combat systems in support of the Program Office
4	Achieve significant and quantifiable cost savings over the product life cycle
5	A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable)
6	Institutionalize methods for proactive management of COTS including DMSMS issues
7	A system that leverages Navy and commercial supportability assets and provides a networked solution
8	Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation
9	Forecast budget requirements in support of the programs/war fighter/consumer
10	Improve schedule flexibility and support options of system upgrades or new development initiatives

Appendix A Table 3: Goals (Requirements)

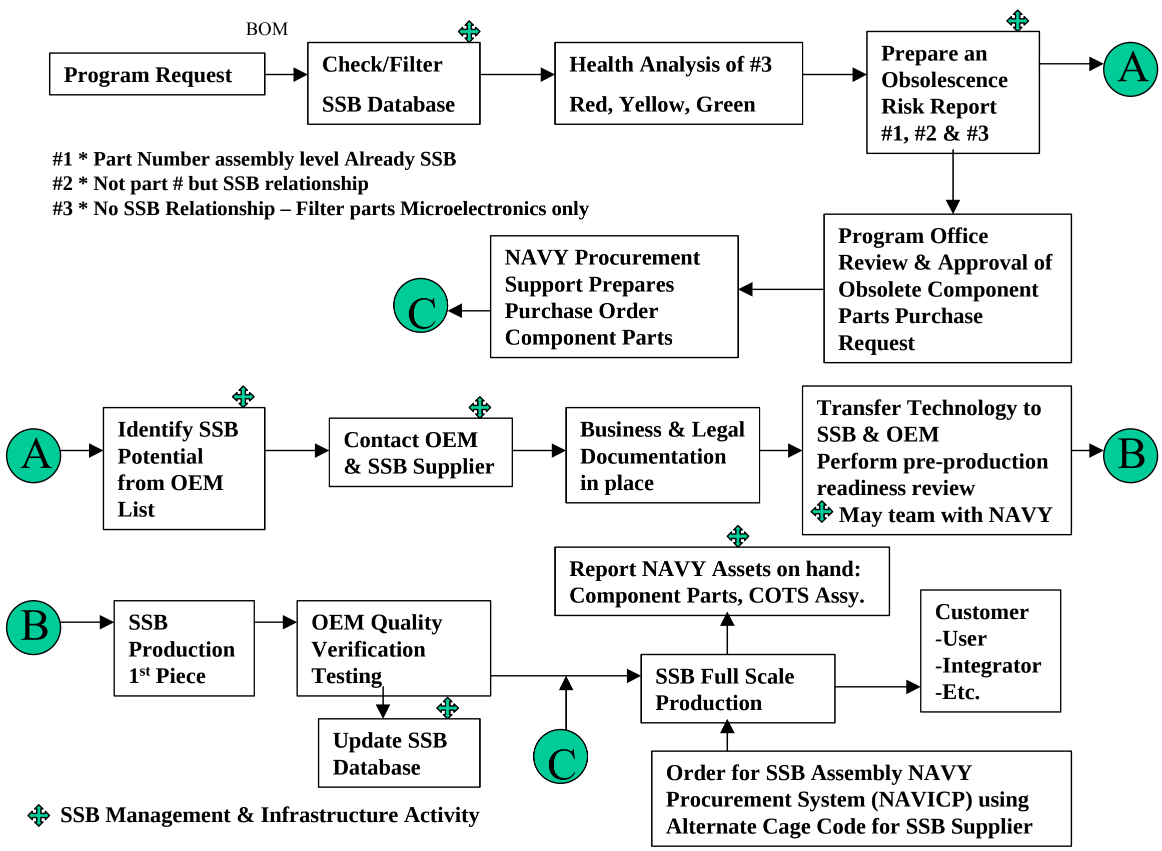
D. INTERFACE MANAGEMENT

1. Program Management Office

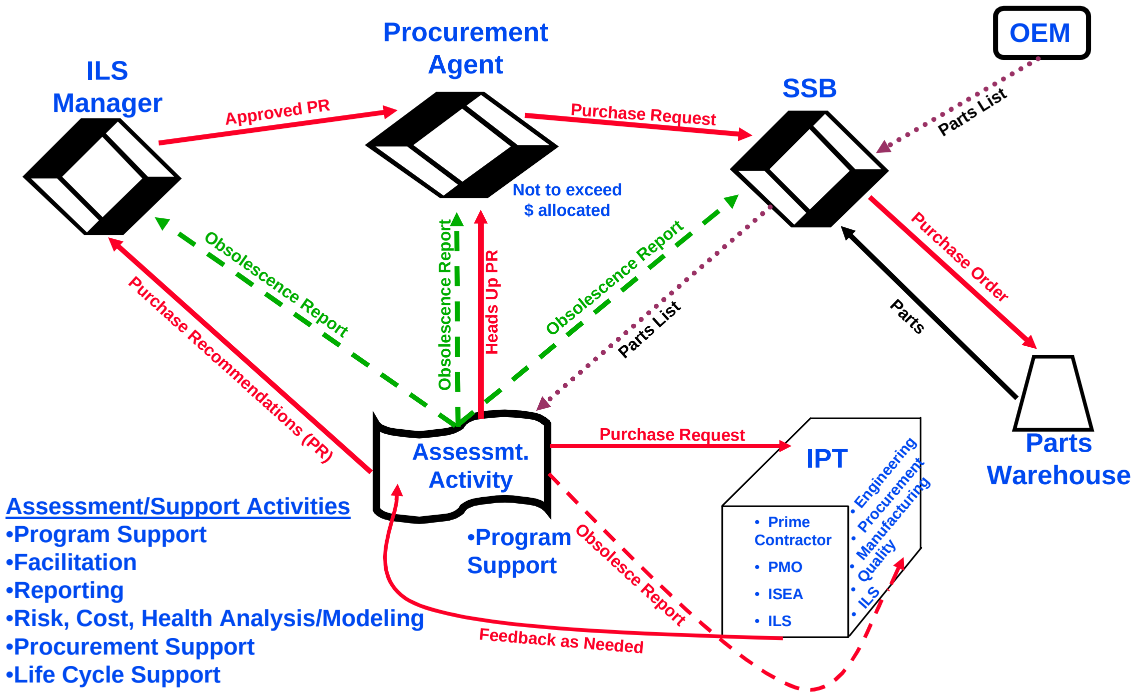
Currently: The PMO through its Integrated Logistics Support (ILS) group orders COTS assemblies through the normal support systems by contract, purchase order, or Navy supply system. If an OEM no longer supports a product, then the Program Office must look for another avenue to solve the issue, typically an engineering analysis and review is necessary yielding a variety of solutions most of which are very expensive. If the program office is lucky or just well informed (which is not always the case), the OEM will provide a notice stating an "End Of Life" (EOL) date after which the OEM will no longer support the specific COTS product. At this point the PMO must make some choices. Regardless of the choices made, the Program Office incurs a significant amount of risk usually at a hefty price.

Proposed: The collaborative process is illustrated using two notional graphics, Figures 4 & 5, to show the relationship and informational interfaces between the Program Office and the other identified players. Figure 4 shows the process flow at a functional level delineating the relationship each player has to the others during the SSB

development. As a collaborator in this process, the PMO provides the funding resources to internal government activities to facilitate, assess, and report. Also, the PMO is agreeing to pay for the royalty and provide the Bill Of Material (BOM). For their efforts the PMO receives: 1) an alternate long term supplier of the COTS product and a relationship with that supplier and their associated OEM that may be extended for other OEM discontinued items, 2) as identified in Figure 5, a continuous update to the risk identification and mitigation efforts, proactively adjudicating obsolescence issues seamlessly on behalf of the PMO, 3) provides the PMO with a corporate knowledge data base on which future decisions can leverage, 4) although not identified through the figures, the program gains reparability and testability attributes over the life cycle of the system defined by the Navy's needs. The method of communication being online is nearly in real time so the effort expended by the Program Office is minimal. Product ordering is done using current procurement methodologies.



Appendix A Figure 4: Functional Flow Diagram



Appendix A Figure 5: Information/Data Flow Support Structure

2. Original Equipment Manufacturer (OEM)

Currently: The OEM is usually a leading edge technology/design firm that is market driven and produces at high volume and cost reflective of commercial economies of scale. The fast paced environment requires short-lived products (~18-24 months) to keep up with the ever-changing technology. The business case is just not there to cater to the DoD/government's needs and although the OEM wishes to keep this group of consumers, the momentum of the business cycle keeps the OEM focused elsewhere. Under these circumstances supportability is limited to production run time (~18-24 months) with approximately a 12-month follow-on repair and test capability period.

Proposed: The OEM for their part in the collaboration effort has a lot to gain and little to lose. There is a business case to be made for making a profit from their intellectual property they no longer find useful. The 5-15% royalty is the incentive, but other non-tangible benefits enhance the business aspects in favor of the collaboration effort. Protection of their proprietary design is an inherent part of the SSB process through "Non-Disclosure Agreements (NDA)" and contractual mechanisms. Important to note is that the contractual arrangements are made with another company, the SSB

supplier, not the government, which many OEMs find favorable since governmental red tape would poison the business case. This situation leaves the ownership and control of the commercial products in the hands of the industry. Additionally, the government does not have to pay for the design only the product, a tenet of Acquisition Reform. By participation in the collaborative system the OEM establishes a long-term relationship with the DoD/government without the ongoing supportability issues. In turn these new emergent properties of the system can be used to enhance the ability of the OEM to market enhanced product supportability, not only to the DoD/government environment, but also any entity, which is configuration constrained due to the business constraints (i.e. refineries, paper mills, electrical power generation and control applications, etc.). The OEM efforts are concentrated during the establishment of the SSB supplier and play a crucial part in assuring that the OEM reputation will be in safe hands when the SSB supplier delivers products. The OEM however does agree to allow the internal Navy resources visibility into the products design by letting the SSB supplier share the parts list complete with associated component vendor information along with a top level assembly drawing. This is information the government has not been privy to in the past but it is essential for accomplishment of risk analysis and yielding the desired emergent properties of the system.

3. SSB Supplier

Currently: The SSB supplier is envisioned to come from the large base of smaller suppliers who, over the past three decades, have provided the DoD/government with high tech. custom products. Using this supplier base will reduce the risk caused during the technology transfer process because of the proven track record earned when dealing with other DoD/government products. However, this will be a collaborative process and the final decision will reside with and between the OEM and the SSB supplier. Here the OEM holds the trump card and must be willing to live with the choice. The small business SSB supplier typically has extensive technical know how in the manufacturing area but lacks the expertise to accomplish proactive, predictive obsolescence management. These companies are customer focused, agile, and seek long-term relationships with their customers.

Proposed: As for their part in the collaboration process, the SSB supplier must be willing to be contractually bound by the agreement with the OEM and at the same time be willing to work the internal government resources to coordinate and facilitate supportability efforts while reducing risk to the program. Actions required by the SSB supplier will include:

- sharing the OEM parts list and drawings,
- be the purchaser, stock handler, and storage facility for parts that have gone obsolete and are awaiting consumption once an assembly order is placed,
- as requested by the program, be willing to stock all up assemblies (which have already been paid for) to enable immediate turnaround times of fielded assemblies which have failed,
- accept all the responsibility for being the prime supplier of the subject assembly.

In return for its efforts the SSB supplier is rewarded through:

- a new relationship with a pre-eminent commercial firm,
- a new product line,
- new customers, DoD/government and non-government,
- long term relationships with the new customers which enables long term business planning,
- technical partnering with internal DoD/government resources not only for predictive obsolescence management but a whole host of other specialties.

4. Internal DoD/Government Resource

Currently: Most, if not all, of the functions identified in Figure 4 are already accomplished by internal DoD/government resources; however they are done in an ad-hoc fashion without the collaborative environment, and with no defined, supportable, and repeatable process in place. The expertise has always been available in the DoD/government but in a different form using a different process. Prior to Acquisition Reform, the MIL-Specs and Standards provided a requirements-rich environment with well-defined processes for implementation. These processes and implementation methods required the same expertise needed today but applied in a different context. Today's environment is requirements-poor, and the talented expertise must adjust to this performance-based versus MIL-Spec-based environment. The context in today's

environment is relationship-based, not rule-base, and the survivability of this entire group of talented experts will depend on their adaptability to today's context. Acquisition Reform removed the barriers put in place by the MIL-Spec, rule-based environment, but it failed to provide an adequate substitute, which would provide a robust process that can meet the supportability requirements and needs of the end user.

Proposed: The internal DoD/government resources have a very crucial role to play regarding the supportability of all our systems from design to fielded systems. Supportability is an inherently governmental function for several reasons: 1) the motivation of our internal resources is in support of the end user needs; this perpetuates and enhances our positions and esteem, 2) due to the overarching scope and the long term broad based characteristics of supportability issues, no one prime contractor could, without conflict of interest, accomplish these functions, and 3) No entity has or even wishes to obtain the corporate knowledge maintained by our internal resource pool. The collaborative environment as is evident in Figures 5 & 6 embeds the talented expertise into the SSB process in a way, which leverages these resources and creates a value stream for the program. The relationship building characteristics of our internal resources is very evident in Figure 6 where this crucial resource takes "center stage" in enabling the collaborative system. Taking both figures (5 & 6) in concert it is easy to see how the resource can gain program equity and support by reducing Total Ownership Cost (TOC), extend supportability of systems, and reducing program risk.

5. Summary: Interface Management

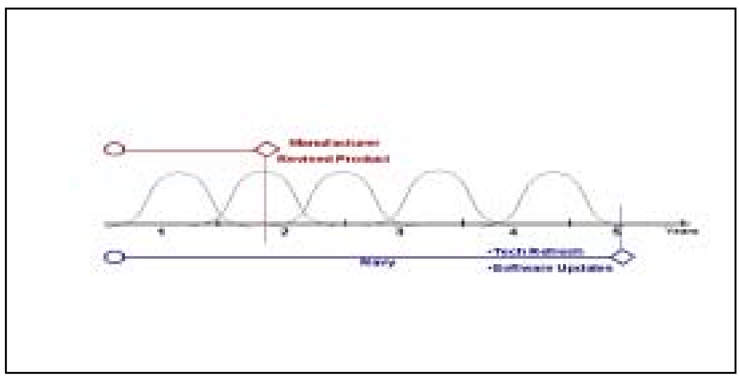
At the core of this collaborative approach is the management of interfaces. The planned development of the standalone SSB system from the overarching system, comprised of existing key entities, constitutes a collaborative architecture. Because the function and form of these existing entities is already defined and all operate as independent systems, interfaces between these entities become critical for effective collaboration. Thus, interface management is an important discipline that must be implemented in order for the SSB system to be successful. A means of effective interfacing is also crucial to the success of this system. A primary mode of communication between the entities will be the World Wide Web and Navy & Marine

Corp. Intranet (NMCI). Current Navy assets, such as GIDEP, Cost, Health & Risk Models, DMSMS notifications, technical data packages, supportability procurements & decisions, etc., will be shared via electronic means. The designated Assessment Activity, as part of the Business Planning & Facilitating function, will perform interface management and facilitate communication/data-sharing methods in support of the Program Office.

E. TIMING

Technology advances pose greater problems to Navy procurements than for consumer products. Components, sub-systems, and systems developed for the military have far longer life cycles than their commercial and customer equivalents. The Navy is a low volume consumer compared to the other markets. We need to leverage commercial and consumer development due to their economies of scale to reach our performance goals. This process leaves a significant gap in the product timeline when the commercial/consumer life cycles are over and suppliers move on to next-generation technology.

Appendix A Figure 6: Technology Refresh Cycles

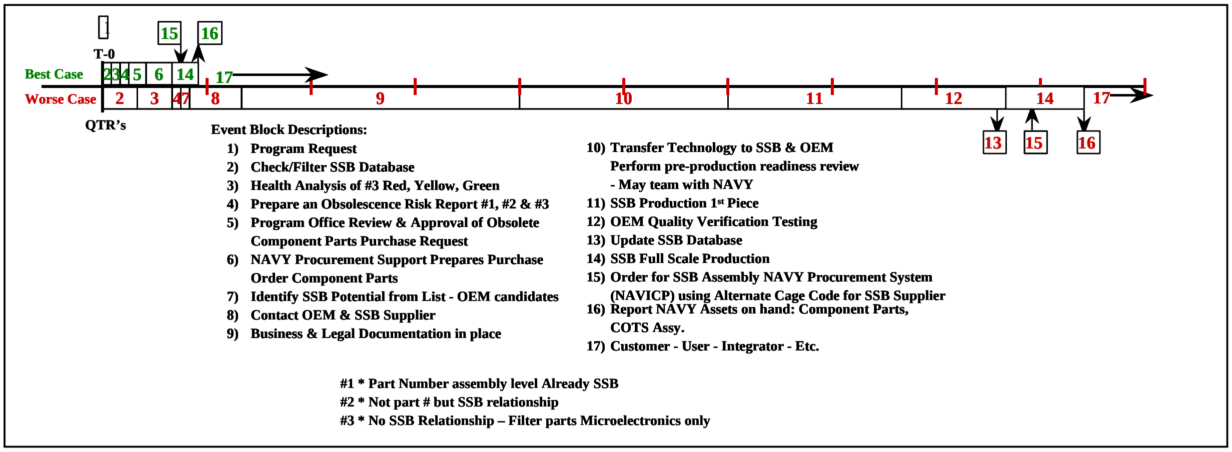


As indicated in Figure 6, approximately five years goes into planning, scheduling alterations, building, testing, refreshing technology and performing software updates for military equipment. In contrast, the consumer market is characterized by low development costs and very rapid development cycles, usually 18 months. These costs are recovered by the manufacturer over the short product lifetime with high volume production and sales. Costs are often less than pennies per unit based on the size of the manufacturing run. In contrast, the Navy procurement cycle is characterized by high development costs over a far lower volume production. The Navy cannot afford to expend redesign costs every five or ten years – not to mention every six to eighteen months. Military development costs are usually many thousands of dollars

per unit and may in a number of cases be more than the cost of the hardware itself. It is not just a matter of replacing one piece of COTS equipment or making slight changes; software and interfaces to other equipment can be affected or the entire systems may require redesign all the way down the affected line.

The SSB does not shorten the production cycle time for military applications. It establishes a process to maintain government inventories until a lifecycle change or product improvement is desired. In this sense, SSB permits program management and ultimately the end user the flexibility to determine the time and path to take to incorporate system improvements. It provides manufacturing / production capabilities that meet the needs of a fielded systems life cycle. This not only includes initial fielding and spares but long-term replacement parts, repairs, logistical support and testing capabilities over the entire life cycle of the product. Additionally, it provides leveraging of small run productions and rapid ramp-ups attributed to smaller businesses.

A SSB team will necessitate collaborative participation from the program manger, the SSB assessment and reporting activity, the design activity, in-service engineering/procuring agency, the prime contractor Original Equipment Manufacturer (OEM), the supply contractor, and the Fleet. For a best-case scenario, a SSB process could be executed in less than one quarter of a Fiscal Year (FY). However, the worse case cycle could take more than 2¼ FYs. The significant delays in this extended cycle hinge on legal, technology transfer, supplier start-up, and branding issues. These two paths are shown in the Figure 8 below. While the first attempt at establishing a SSB cannot realistically be completed in only one quarter, it similarly should not typically take 2¼ FYs. These timelines imply consideration should be given to the establishment of a SSB based on program milestones. Until systems enter at least a limited production phase, the efforts associated with creating a SSB may not be warranted. For systems that are in full production and expecting at least a five-year run the SSB process should be strongly considered. A minimum three-month to 1½ FYs should be the anticipated processing time to create a SSB relationship, depending on regulations and complexity. Each individual program and each OEM and SSB supplier team is likely to have an independent timeline that cannot be identified until the process is in place.



Appendix A Figure 7: SSB Process Timeline

Once in place, the SSB process would typically be expected to follow this sequence of events:

1) COTS manufacturer identifying a drop-in replacement part is available,
2) ECP and other documentation/database reviews are prepared, coordinated, scheduled,
3) Legal verification, sharing of technical data, and configuration review,
4) Developing, executing test and QA of new COTS hardware,
5) Updating drawing package and completing ECP/documentation, and
6) Performing technical manual updates and providing operator training.

F. USER

The focus of this paper is for Navy implementation of the SSB architecture. That does not preclude other services, government agencies, or the commercial world from implementing this process, and in some commercial sectors, they already have.[7) Plotkin] While we believe the SSB can improve both processes and products across DoD entities, there can be many users of the SSB process. The architecture of the system is defined such that it could be used by any DoD entity or associated allied / Foreign Military Sales system. It has the ability to be customized to meet the needs of nearly any end user or decision-maker. The key to the SSB is to always remember that it is a collaborative effort.

Collaborative systems are assembled and operate through the voluntary choices of the users, not through the mandates of an individual. Problems arise when the developers believe they have greater control over the evolution of a collaborative system than they actually do. They may fail to ensure that critical properties or elements will be incorporated by failing to provide a mechanism matched to the problem.[6) Maier-Rechtin] The SSB architecture takes into its design a robust collaboration where direct control is impossible or inadvisable. This Systems-of-Systems approach possesses the following emergent properties defining the characteristic of a collaborative system:

- SSB fulfills valid purposes in its own right, and will continue to operate to fulfill those purposes if disassembled from the overall system.
- SSB is managed for its own purposes rather than the purposes of the whole.

The SSB collaborative systems architecture teams the program manger, the SSB assessment and reporting activity, the design activity, in-service engineering/procurement agent, the prime contractor, OEM, the sunset supply contractor and their related parts support, and the Fleet. The tactical intent of the SSB is to ensure that parts replacement is transparent to the operators/Fleet and that the parts are available in the supply chain in a timely fashion. Form / Fit / Function / Features, the four F's of the supply chain, must be one-to-one with the original product.

As a management tool, program offices can use the SSB in the acquisition of new systems and in conjunction with in-service engineering activities that must continue to procure, repair, and replace parts for the Fleet. The SSB can support integrated logistical support functions, which must account for the long-term support of fielded equipment, and must support equipment between changes to the equipment base line. SSB will help program offices project the availability of products that extend beyond the 2-year POM cycle and the 3-5 year implementation cycle by making use of health / cost/ risk models which quantify the availability, supportability and obsolescence of fielded systems. It provides the program office a tool to optimize its upgrades, re-designs, technology refresh intervals, and other product enhancement cycles. Additionally, program risk is reduced through the use of the SSB.

The assessment / reporting activity will use the SSB to obtain and maintain a stabilized baseline and retain system certification. Use of the SSB can be implemented at various phases of development such as: during the initial integration and continued support, the interoperability support of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc.). Also the design and development activities can use the SSB to define commercial product availability before a design goes into production.

The OEM supplier will use the SSB system to claim long-term life cycle support of fielded products at lower costs and less impact during implementation on current and future systems. Through the sunset supplier the OEM associates their name with a long-standing relationship with the users. Concurrently the OEM could use the SSB system to obtain compensation/royalties for each item sold.

The SSB supplier uses the process to obtain new customers, new product lines, and builds long term relationships with the using community. Through collaborative efforts with the assessment / reporting activity the SSB supplier can be assured of a source of supply for component piece parts needed in producing the systems they were contracted for, while reducing the supportability issues associated with commercial products.

The user who derives the most benefit from the SSB is the Fleet. It is this end user who must operate our weapon systems and provide the expected defense as defined in our national strategic policies. The SSB system provides long term stability to all support tools, methods, and processes such as: technical manuals, testing procedures and methods, drawings, trouble shooting information, parts lists, parts availability, parts replacement and other needed support. The process improves system / hardware / software consistency across the Fleet by striving to provide better weapon system configuration control leading to improved system compatibility between platforms or ships. The SSB system will improve interoperability while reducing interoperability defects.

The outbound marketing approach for sales and distribution is to provide the end-user (i.e., the Fleet) with a continuous supply of the required product, at a lower cost, while providing enhancements when and where appropriate. Following the original procurement a secondary source provides the product and distributes it via normal supply chain (i.e., same P/N, form, fit, function and features). In so doing the Navy gains long term supportability, maintainability and operational readiness.

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III. CONCLUSION

This paper has demonstrated that the SSB architecture is an affordable approach for mitigating program supportability risk. As a collaborative system, the information that is derived from the identification and mitigation of risk is quantifiable and will be readily accessible to all SSB team participants. The process takes into account the fact that the supportability of fielded hardware is defined by the warfighter. It extends the life cycle and supportability of COTS and ensures a late-life cycle supply source. In so doing, the SSB permits the DoD to be successful in leveraging commercial developments with appropriate economies of scale in order to reach its military performance goals while offsetting the problem of diminishing material.

The SSB system will assist the Program Management Office (PMO) by providing infrastructure support to existing platforms / combat systems. If chosen, this support can be provided early in the development process, providing objective evidence in demonstrating COTS components ability to support existing weapon systems; thus providing significant reductions in program risk related to COTS and life cycle management. The SSB provides predictive information for PMO decision-making process. The outputs of these trade-offs and assessments will gain the PMO a high level of confidence with the warfighter/customer. The process is applicable to various DoD entities and their contract strategies. If aggressively integrated across DoD, component commonality could lead to flexible integrated logistical support, thus incentivizing the commercial industry to develop long-term relationships with the sponsors and users.

The SSB is sensitive to proprietary design rights and provides a proactive forum for contractual negotiations. The methods employed improve the detection of product supportability problems and provide sufficient time for analysis of alternatives and solutions in the decision-making processes. This technology assessment can be implemented at the piece part, lowest replaceable unit, subsystem or multiple platform level. The SSB approach is to procure assemblies when the customer requires them. In this way, it achieves significant and quantifiable cost savings over the product life cycle. The process provides cost structures that track and continually assess progress over the

entire product life cycle. This information permits informed decision-making contributing to life cycle cost savings without the need for Life of Type Buys (LTB) at the assembly level.

Use of the SSB will improve schedule flexibility by providing support options that can be tailored for the activities needed and the warfighter. It will reduce provisioning timeframes and place the responsibility for stockage, storage, and issue of COTS spares and repair parts on the supply contractor. The SSB system enables many activities and functions: immediate supportability, elimination of government inventory stock levels, utilizes large commercial distribution systems, no source inspection, commercial packaging, fast and direct delivery to the warfighter, and warranty of components. The SSB process has definable and repeatable characteristics that provide a comprehensive and flexible solution to supporting fielded hardware. It provides programs with an independent utility for implementing COTS products and has minimal or no impact on system operational performance. Once implemented, the SSB is an affordable, expandable, repeatable and reliable process that will meet the users performance expectations. It provides the best of both worlds. It leverages the inherently governmental functions of the Navy supply process and coordinates with commercial supportability assets through a thoroughly meshed and maintainable communication network solution.

IV. LIST OF REFERENCES

1) Glum, Ted (2000). Support for the Warfighter. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

2) Robinson, David G. (2000). DSCC DMSMS Management. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

3) Hartshorn, W.T. (2000). Obsolescence Management Process as a Best Practice. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

4) McDermott, John T. (2002). Reducing the Impact of Obsolescence in Military Systems. In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

5) Osmundson (2001) PD-21 Systems Architecture, Spring Quarter 2001, Prof. John Osmundson's Lecture Notes

6) Maier-Rechtin (2000) Maier & Rechtin, "The Art Of Systems Architecting," 2nd Edition, CRC Press, copyright 2000

7) Plotkin, Martin S. (2000), A New Industry – the Emerging DMS Market, COTS Journal, Volume 2 Number 7, pages 33-35

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V. ADDENDUM

A. DATA DICTIONARY (FOR TABLE 1)

1. Designing & Developing Products:

Function: It is during the product development process that the need for "dependable & cost effective supportability insurance for fielded hardware" must be planned for and implemented providing for a proactive approach to obsolescence and material shortages issues involving Commercial-Off-The-Shelf (COTS) equipment. Primary sub-functions consist of <u>Parts Identification</u> and <u>SSB/Alternate Parts Identification</u> whereby parts and assemblies, which are at risk for obsolescence/shortages, are identified early and alternate parts or SSB parts are found for a solution.

Form: This function may be performed by Contractor, Subcontractor, or Government Activity.

2. Acquiring: Acquisition Program Support:

Function: It consists of a number of key program management sub-functions including <u>Contracting</u>, <u>Planning & Budgeting</u>, <u>ILS Planning</u>, <u>Vendor Selection/Surveying</u>, <u>Trade-Off Studies</u>, and <u>Health</u>, <u>Cost</u>, and <u>Risk Analyses Reporting</u>. This function provides the final decision making authority for all decisions relating to planning and risk mitigation efforts for equipment obsolescence, obsolescence management, and material shortages. The Contracting sub-function will emphasize the use of contract incentives for effective obsolescence management and participation in the SSB process. The vendor source selection sub-function will also focus on good obsolescence management practices and participation in SSB. The Health, Cost, and Risk Analyses Reporting activity is part of this Acquiring function.

Form: This function is performed by the Navy PMO with the support of Navy Field Activities, government support Contractors and Laboratories as directed. Health, Cost, and Risk Analyses will be conducted by designated Navy Field Activities in support of the PMO to determine the extent of current or potential obsolescence or material shortages issues and to establish mitigation priorities. Results will be delivered to the PMO for subsequent reporting. The Assessment Activity will perform the Risk

Analysis and the Program Support Activity will perform the Health & Cost Analyses. Field Activities will collaborate to develop the results of the Analyses to ensure a complete assessment.

3. Manufacturing/Producing Product:

Function: Primary sub-functions associated with Obsolescence Management and Material Shortages include Purchase Ordering, Parts Stockage/Storage, and Manufacturing/Production. The Manufacturing/Producing process requires a supply of components and assemblies. The Manufacturer routinely orders parts and stocks them prior to issuance of a work order or bill of materials. Parts are kitted and processed through assembly and test operations producing a final product in the end. The SSB process identifies and procures obsolete parts that may be used by the Manufacturer in cases where parts are no longer available due to Diminishing Manufacturing Sources Material Shortages (DMSMS) issues.

Form: The function is performed by the Prime Contractor, associated subcontractors, the Original Equipment Manufacturer of a components & assemblies, and Sunset Suppliers.

4. Business Planning & Facilitating:

Function: This function utilizes current Navy assets operating in a collaborative environment (system) with a single focus on supportability. These assets must be included to develop relationships for the SSB system. This function consists of the following tasks, many which are considered inherently governmental:

- Technology Roadmapping
- System Health Modeling
- System Cost Modeling
- Fleet Failure Database
- Material Support
- Procurement
- Stores (shore/Fleet)
- ILS Planning
- Fleet Support

- Integration Sites
- Supply Base Management
- Sunset Supply Base Development/Management

Form: The responsibility for this function is shared by various Navy assets and activities (see Table 1). The first critical sub-function is Facilitation. This refers to the teaming and partnering function required to enter into business and teaming relationships with both Navy and Contractor organizations to establish a framework and process for a proactive management of COTS including DMSMS issues. These relationships are codified through the generation of Memorandums of Agreement/Understanding (MOA/U) among the Navy, OEM, and Sunset Suppliers. The end game of this process is to provide on-going Supportability for fielded hardware. The Assessment Activity, i.e., the Navy Field Activity designated this role by the PMO, will provide Quality Assessment to ensure the objectives of the process are met. All team members will periodically perform Technology Roadmapping and assessment to ensure the most affordable and reliable solution. As part of the partnering arrangements among prime contractor, OEMs, and Sunset Suppliers, Purchase Requests will be generated which ensure a reliable supply of sunset parts and assemblies. Finally, these Business Planning and Facilitation functions will institutionalize methods for proactive obsolescence and material shortages management across DoN and DoD (i.e., Coordinate across DoD).

5. Interfacing: Methods & Management:

Function: One of the most important functions is the manner in which information is shared among the Navy and Contractor organizations. This also includes effective communications methods. The information technology revolution has provided a number of effective tools, which facilitate the process of mitigating obsolescence and material shortages issues and providing viable solutions. Figure 1 illustrates how the World Wide Web (Internet) and the Naval & Marine Corp Intranet (NMCI) provide convenient On-Line Accessing and are used to network Navy and commercial activities to provide quick and reliable solutions.

Form: Technical Data Exchange is performed among participating entities for early indication of obsolescence and shortage issues through DMSMS Alerts. The

Government Industry Data Exchange Program (GIDEP) maintained by NSWC Corona Division contains a large repository of DMSMS Notices. GIDEP has approximately 1600 participants throughout Government and industry who share DMSMS information and solutions. Finally, ad hoc or Specific Requests for DMSMS information can occur via email, fax or phone from and to all participating entities in this process.

6. Performing Risk Analysis:

Function: One of the first tasks will be the performance of a risk analysis to determine whether or not there is significant supportability risk for program/hardware under review. This should be done in conjunction with the Health and Cost Analysis performed by the Program Support Activity (Health Modeling Activity). The Risk Analysis function involves the Identification and Classification of Risk. Classification refers to assigning a risk level to the identified risk based on some set of qualitative or quantitative criteria. Risk levels are generally Low, Moderate, and High. For all Moderate and High risks, risk mitigation strategies must be planned and implemented. In addition to health and cost issues, program issues, product/DMSMS issues, and business issues can also be identified as risks. The final two steps consist of Reporting Risk and Mitigating Risk. Risk will be reported to the PMO to support the Risk Reporting sub-function in the Acquiring function. The end goal is to put in place strategies and solutions that will mitigate the DMSMS risk to a program.

Form: This is a key function performed by the Field Activity designated as the Assessment Activity.

7. Performance Assessment:

Function: This function consists of two critical sub-functions. After gathering much supporting data, a Purchase Recommendation is made which will hopefully mitigate the obsolescence or material shortage risk. This function will evaluate the effectiveness of the recommendation prior to final decision-making by the decision-making authority (i.e., the PMO). In addition, Measures of Effectiveness (MOE) or metrics will be established and tracked to ensure the SSB collaborative system is providing best value to the Fleet. MOEs will be used to manage the process effectively and to continuously improve the process.

Form: The Assessment Activity will have the responsibility for performance assessment. This will include providing inputs to the purchasing recommendation or evaluating the purchasing recommendation made by another entity. The Assessment Activity will take the lead on metrics generation and tracking. They will have the responsibility for reporting metrics to the SSB process community on a periodic basis.

8. Product Usage:

Function: This is the act of using an alternate source of supply or Sunset part/component resulting from the SSB process.

Form: Using entities can include the Fleet, Shore Activities, Integration Sites, and Contractors.

APPENDIX B: SUNSET SUPPLY BASE SYSTEM SYSTEMS ENGINEERING DEVELOPMENT AND IMPLEMENTATION PLAN

THE SUNSET SUPPLY BASE: LONG TERM COTS SUPPORTABILITY, IMPLEMENTING AFFORDABLE METHODS AND PROCESSES

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ABSTRACT

The Systems Engineering Development and Implementation (SEDI) plan is one of four foundational documents prepared in support of the thesis: "The Sunset Supply Base: Long Term COTS Supportability, Implementing Affordable Methods and Processes." The SEDI plan defines a roadmap for implementation of the supportability concept and when combined with the other three foundational documents: The Sunset Supply Base Systems Architecture, The Sunset Supply Base Business Case Analysis, and The Sunset Supply Base Marketing Plan, establishes a transportable, transferable, and repeatable supportability system for Commercial off the Shelf (COTS) products. The SEDI plan is structured in three sections: Infrastructure, Implementation, and Measuring & Assessing. The approach is intentionally focused on supporting the person(s) actually performing the implementation function. Insight into the process is provided by specific examples called "Implementation Experience" and embellished by "Lessons Learned" to help enable the implementing process. The tools, methods, and processes described are illustrated through actual examples where these practices were used to implement the SSB system on three Navy programs. These tools, methods, and processes are provided in detail in the enclosures so that they may be used, not only for guidance but also for a reusable template for future work. Read on and Enjoy!

The nature of the SSB thesis topic and the approach taken by the authors necessitated the use of examples, templates, tools, methods, and practices. These implementation tools and deliverable products are illustrated through a set of enclosures referenced in the thesis and its appendices. Most of the enclosures are static examples generated during the implementation of the SSB system on three Navy programs. However, other enclosures are not static and are therefore provided on a web site (URL: http://www.anavision.org/ssb.htm) in the Excel format to provide a dynamic model for use by an implementer of the SSB system.

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LIST OF ABBREVIATIONS AND ACRONYMS

17 Steps	SSB Implementation Process
20X	AN/ASQ-20X Mine Hunter
APM	Assistant Program Manager
BOM	Bill of Material
COTS	Commercial off the shelf
COTS/NDI	Commercial off the shelf/Non-developmental items
DA	Design Agent
E&MD	Engineering and Manufacturing Development phase
EOP	End of production date
EOS	End of service date
FAR	Funding Allocation Review
FAR	Federal Acquisition Regulations
IEEE 1722	Capability Assessment Tool
ILS	Integrated Logistics Support
IPT	Integrated Product Team
ISEA	In-service Engineering Agency
LCC	Life cycle cost
MOA/U	Memorandum of Agreement/Understanding
MRDB	Material Readiness Database
MTBF	Mean time between failure
NAVICP	Naval Inventory Control Point
NDA	Non-disclosure agreement
NSWC Crane	Naval Surface Warfare Center, Crane Division
NSWC Corona	Naval Surface Warfare Center, Corona Division
OEM	Original Equipment Manufacturer
ORD	Operational Requirements Document
PM	Program Manager
PMO	Program Management Office
POC	Point of contact
POM	Program Objectives Memorandum
ROI	Return on investment
SA	Systems Architecture
SEDI	Systems Engineering Development and Implementation Plan
SOW	Statement of Work
SSA	Software Support Agent
SSB	Sunset Supply Base
SSDS	Ship Self Defense System
TDA	Technical Design Agent

I. THE SYSTEMS ENGINEERING DEVELOPMENT AND IMPLEMENTATION (SEDI) PLAN

A. PURPOSE

The purpose of this plan is to put into perspective the processes, methods and tools needed to implement the Sunset Supply Base (SSB) system. This document is presented as a "stand-alone" prescriptive set of actions, which can be taken in the establishment of an SSB system. However, this document does not portend that it is the only process or method to establish such a system but instead is the method the authors have chosen to implement the SSB system. The document is constructed in three major sections, which follow a brief introduction to the SSB system concept. The primary issues grappled with in the SEDI plan are those faced during implementation and encountered primarily when bringing the idea into reality. The first section of the plan addresses introduction to the program and the infrastructure needed to support the effort, such areas as: teaming structure, computer resources, communication methods, interface with the programs, data structure requirements, management participation, etc. The second section of the plan covers the implementation of the SSB system and, in turn, presents many challenges to overcome in realizing the SSB system. Examples of some of these challenges include: identification of the Commercial off the Shelf (COTS) Original Equipment Manufacturers (OEM), interface methods with the OEMs, interface with the Program Management Office (PMO), understanding the Program's needs and requirements, building relationships between the OEMs and the Navy, identifying suitable partnerships between the OEMs and small build-to-print suppliers where applicable. The final section of the plan identifies methods and metrics to measure the impact of implementing a SSB system, thereby providing adequate indicators for the programs to assess the effectiveness and value proposition in using the system.

B. INTRODUCTION

The SSB concept is a unique After-Market approach to extend the supportability of COTS products predicated on the needs of Navy Programs. The extension of product availability, beyond the OEM assigned date to drop the products as obsolete items,

provides stability to the system baseline configuration, during periods of time between installation and scheduled Technical Refresh/ Insertion. The uniqueness of the SSB concept is evident through how it is structured. The OEMs are: a) market driven, b) high volume and high technology, c) their business plan is driven by their commercial customer base, with only about 0.4 % of their business going to Department of Defense (DoD) [1) Glum, 2) Robinson, 3) Hartshorn] and d) experience fast update cycles (< 18 months)[1) Glum, 2) Robinson, 4) McDermott]. In contrast to these OEM attributes, DoD has: 1) unique applications with lengthy life cycles (20-40 years), 2) requires a minimum technology refresh or update cycle of not less than 5 years [4) McDermott], and 3) have operational readiness and maintainability support issue that span the entire Life Cycle. To bridge the gap between the OEM business planning and the Navy's need for long term support a third party is brought in if applicable. This is the Sunset Supplier. The Sunset Supplier makes a contractual relationship with the OEM to produce the obsolete products for the OEM customer base. The OEM transfers the intellectual property and assembly know-how to the Sunset Supplier and for this the OEM receives royalty on the sale of all products produced. Internal to the Navy are support infrastructures to ensure supportability of Sunset products by mitigating any component part obsolescence issues if they exist on those products. The infrastructure and support of the SSB process yields, not only significant cost savings, but also provides other benefits, such as:

1) Supportability of products defined by customer need (5, 10, 15, 20 years.)
2) Life Cycle Cost (LCC) savings, due to no life-time buy at the assembly level is needed, so the assemblies are procured as the customer requires them.
3) Reparability of assemblies over the designated life cycle(5, 10, 15, 20 years)
4) Hardware/Software/Firmware stability between Technology Refresh/Insertion Cycles.
5) Significant reduction in program risk as related to COTS and life cycle Management.
6) Improved schedule flexibility and support options that can be tailored for Fleet needs.
7) Minimal or no impact on system operational performance. The performance will remain constant through the use of exactly the same part: form, fit, and function replacement, which has been made by the alternate manufacturer, the Sunset Supplier.

II. INITIATION AND MANAGEMENT OF A SSB SYSTEM

A. GETTING STARTED

The key in beginning a successful implementation effort is in choosing an appropriate application where the benefits of the SSB system can be realized. Although not limited to addressing the issues germane to COTS product supportability issues, this area was identified as an unresolved and potentially "ripe" candidate to yield a large Return On Investment (ROI) from implementing the SSB system. The funding for such an effort must come from some entity, such as institutional sponsors, PMO, local field activities, or through some kind of initiative. Since the effort is designed to solve supportability issues of fielded hardware it seems only natural to identify a Program which is having problems in supporting their fielded COTS products. From our experience with Programs, making the switch from products built using military specifications to COTS products, the differential in the life cycle management between the two approaches is profound, so much so that to our knowledge every COTS implementation brings with it a whole set of unresolved risks. Resolution or management of these risks is the primary purpose of implementing the SSB system. Therefore one of the prime targets in obtaining support and funding resides in the PMO since it is the Program Manager (PM) who is ultimately responsible for the life cycle support of the products delivered to the Fleet.

The SSB system being a collaborative effort will require extensive teaming and partnering both within your local organization and external to your local functions. The subject of teaming and partnering is so important to the success in initiating and management of the SSB system that each step of the process described below will illustrate certain external interfaces that demand participation in these activities. These external activities must be supported through an internal local teaming effort since the implementation effort is broad in scope and cross functional in nature. Establishment of a local support team is described in the last portion of this section and is intentionally placed after the SSB system requirements so that the uninitiated, new implementer can scope the task. Although the local teaming effort description is provided after the

description of other implementation actions, the actual sequence of events should take place with the local teaming effort being performed first. The local support team is the enabler, which allows successful accomplishment of all other activities. The external interfacing requirements are provided first to establish the boundaries, goals, scope, objectives, and purpose as background for formation of an internal local team. The reader is advised to study the SSB system requirements prior to establishment of a support team.

B. DEFINE THE CHALLENGES

The SSB system is built on a collaborative System Architecture (SA), which means that an entity must choose to join the system and stay with the system. The agreement to implement such a system must have compelling logic and be substantiated through some track record or justifying data. Even with pilot program examples and an implementation track record, a program without experience with the SSB system will want to know: "How will this apply to my Program?", "What will be the impact in our unique situation?", "What assurances can you give me that the SSB system will be appropriate for my program?", etc. The questions go on and on but are focused on one primary issue: Is this the right thing for our program? To answer any of these questions, you as the implementer will need to do your homework. If this is not already a program you are working on, you will need to make it your program by finding out as much information as possible about it. The immediate goal should be gathering information regarding the Program; below is a starter list of important areas or documents which may be of help:

1) What is the program scope and hardware application?
2) Is the system certified: certified combat weapon system, safety certified, etc.?
3) Review of reference documentation: Operational Requirements Document (ORD), Mission Profile, Operational Requirements, etc.?
4) What organizationally driven policies and requirements regarding COTS are impacting the Program?
5) Contractual arrangements: Performance Based Logistics, Organic Maintenance, Full Service Contract, etc.
6) Financial issues: Budget, funding, Programs Objective Memorandum (POM), etc.

7) COTS issues and/or support efforts attempted or on-going

8) What type of Configuration Management process is implemented in support of the Program?

9) System Software impacts due to COTS

10) Integrated Logistic Support (ILS) approach

11) What stage in the life cycle is the Program hardware that needs to be supported: legacy, Engineering & Manufacturing Development (E&MD), new design, etc.?

12) What is the fielding schedule and how many platforms, for how long?

13) Are there any intentions or planned tech refresh/insertion points (i.e. years between tech refreshes)?

14) Program organizational structure

15) Current COTS efforts

16) Points Of Contact for primary responsibility in the area of COTS management, ILS, refresh issues, etc.

C. APPROACHING THE PROGRAM OFFICE OR DESIGNATED REPRESENTATIVES

Each program opportunity will be different and a customized approach must be developed to support the unique program needs. Even though the program requirements will be unique, the basic needs can be met through modification of documentation used on other previously successful programs because the basic needs of most programs are similar. In this portion of the SEDI, the subject matter is decomposed by functional activities that need to be addressed to implement an SSB effort. The functional activities are supplemented with examples, illustrated through documentation from successful implementation efforts on three pilot programs. The list of these functional activities includes: initial contact, defining Points of Contact (POC), establishing roles and responsibilities, and initial estimates regarding the effort. Important to note is that the SSB system is a departure from the traditional government oversight approach and requires dedicated involvement in all aspects of the implementation effort. Buy-in of the effort at the highest levels in the program is of utmost importance. As a new and different method in solving the COTS supportability challenges, there will be push-back from many individuals in the program organization, who will find it easier to say no, than to take the risk of an innovative concept.

Implementation Experience:

In the case of SSDS MK-1, the lead engineer responsible for the long term supportability of the system, during the kick-off meeting, noticed push-back and questioning by the Integrated Logistics Support (ILS) community of the proposed SSB effort. He then stepped in, to emphasize that the program has chosen the SSB system direction. After receiving the blessing of the Captain of the program with regard to the approach, the lead engineer stressed, that regardless of the perceived risks the SSB system has been chosen because the decision was based on the long term value proposition to the program, so overcome the resistance to the idea and support the effort. The AN/AQS-20X Assistant Program Manager (APM) had tasked the SSB effort directly and assembled a team to work on the ILS support for the program. The team in general expressed apprehension and skepticism about the probability of success of the SSB system. The APM was frank and explicit in his demands that the program direction is to implement the SSB system on COTS products.

Lessons Learned from this Experience:

Your best bet as an implementer of the SSB system is to receive the highest level of buy-in within the program and to have that supporter understand the value added proposition in using the system. At the various organizational levels in the program, it is easier to say no and retrace the steps that were used in previous times, then it is to try new methods with their associated risks. The importance of Top-Down roll out of the SSB effort, although not absolutely necessary, is one of your best avenues to success.

Like all first impressions, the initial contact with the Program Office or their chosen representatives in introducing the SSB system will have a great impact on your ability to enlist their support and obtain their sponsorship. Although there exists a multitude of independent attributes that contribute to making a good first impression, our inclination is to focus on three predominate factors. First and most important from the program's perspective will be the professionalism and knowledge of the person providing the presentation. As will be evident during the implementation of the SSB system, an in-depth knowledge of many of the characteristics of Systems Engineering must be

exercised to have an effective implementation effort. An understanding of the following areas is considered necessary in order to handle emerging issues:

1) Good, people skills including teaming skills
2) Knowledge of contracting methodologies, constraints, and impacts
3) The ability to build relationships and partnerships
4) Understanding the design, development, deployment, testing, and support processes employed by the program
5) The ability to learn the specific manufacturing processes used to make the COTS products
6) Be able to develop and implement a project plan specifically for the implementation of the SSB system
7) Well practiced negotiations skills

The next factor that will help or hinder your initial efforts relies on what you are presenting to your focused audience. Available in Enclosure (1) is a presentation used in briefing PMO, Original Equipment Manufacturers (OEM), and potential SSB suppliers. The presentation provides a general conceptual view on how the SSB functions, introduces the primary players, and the expected outcomes. This presentation has been used as an initial "calling card" to introduce the idea and has been met with success in illustrating the potential value proposition provided through use of the system. As the implementer, your focus must be to understand each and every slide presented because the ideas are identified through pictures, notional representations, diagrams, etc. without a lot of wordy explanations that would clutter up the presentation. The building of a common foundation about the SSB system is the objective of the presentation and details with long explanations can be provided later. Additional information in support of the presentation are typically used to add certain details which improves the understanding of the SSB systems goals. Enclosure (2) is an executive summary which provides a concise high level description of the system. Enclosure (3) is an article from the "COTS Journal", [5) Plotkin]. This article identifies the use of a system almost exactly like the SSB system, as an industrial best practice where it is implemented to support certain industries that are capitally intensive and configuration constrained (i.e. paper mills, power generation facilities, petroleum distillate plants, etc.)

The second focus area that must be addressed very early on is the uniqueness of the effort and that the SSB effort is not a duplication of other activities currently being funded. The SSB Systems Architecture (SA) is specifically designed to leverage the traditional sustainment engineering functions/activities by adding additional functionality; that when, taken in concert with the traditional methods yields new capabilities not provided by either approach used independently. The SSB system was designed specifically to address open issues, which bring undefined large risks to the program. Through implementing the SSB system, new previously undisclosed information regarding details about the components which make up the COTS products is obtained through a collaborative effort: between you as the representative of the program and the COTS OEM or SSB supplier. Since by the very nature of the procurement process for COTS products, only the product is purchased with minimal supporting information. In contrast to the nominal methods of interfacing with the suppliers of COTS, usually through purchase orders, the SSB system invokes the exchange of product details typically by entering into a Non Disclosure Agreement (NDA). Enacting an NDA allows you, as the program representative, visibility regarding the component make up of the COTS assembly and it is this knowledge, which allows you to identify, quantify, and manage the obsolescence risk. It is the combination of the collaboration, the commitment through the NDA, knowledgeable assessment of risk, and teamwork that defines the uniqueness of the SSB efforts. To our knowledge no other system has been successfully implemented to meet these objectives. Enclosure (4) is an example of a Statement of Work (SOW) depicting statements in support of the unique attributes of the SSB system. To help the new implementer who may need an example in crafting an agreement with the OEM or SSB supplier, a “fill in the blank” NDA is provided in Enclosure (5).

Implementation Experience:

In both MK-1 & MK-2 Ships Self Defense Systems (SSDS) programs, the idea of having this kind of visibility was very difficult for the ILS community to accept because it was not part of the normal interfacing routine. The engineering community on the other hand had typically signed NDAs previously, usually for design evaluations, and understood the significance and utility of having access to the detailed information. The

ILS community was confused with the difference in roles between NSWC Crane – the sustainment support activity which identified the obsolescence code (red, yellow, green), on the piece part components level – and NSWC Corona – the activity signing the NDAs and obtaining the component parts lists for each COTS assembly. It took hours of explaining before the ILS community was able to identify the uniqueness of each function and assure themselves there were no duplication of efforts.

On the 20X program the ILS community had much the same issues with much the same resolutions. Although in the case of the 20X program an additional issue of justifying cost effectiveness of the SSB efforts exacerbated the situation. The cost effectiveness of using the SSB system will be dealt with later in this implementation plan but the issue is brought forth here to illustrate how various issues can be compounded and if not handled appropriately may derail the process.

Lessons Learned:

The teams you will be working with will have members that have various levels of understanding and responsibility resulting in different perspectives of your endeavors. The key to success is to take the time, be patient, and where possible develop a tight relationship with other team members doing the obsolescence assessments. The ILS community may be harder to reach at first although they will eventually be very supportive of the SSB efforts. The engineering community seems to catch on to the idea quickly but also brings to the table a lot of skepticism.

As a result of the information gathering process you accomplished in learning about the program, several Points of Contact (POC) probably have emerged. Some of these POCs are within the PMO while others are part of the organizational structure that support the program. Typically there are one or more PMO individuals who provide guidance to the group members that implement the required functions. The members that perform the functional support for the program are as important to enabling the SSB system as the PMO is in sponsorship of it. Close working relationships need to be cultivated with other activities to yield the most optimum outcome.

Field activities tasked by the PMO to provide the needed aspects of support must be interfaced with smoothly or at least non-confrontationally. For example, the activity that supports the software design and maintenance will be impacted by the SSB system due to the stabilization of the equipment baseline provided as part of the system. On the other hand, not all answers will be found through the hardware and in some instances a small software change can mitigate the impact of the changes in the COTS hardware products. Due to the interactive nature of COTS hardware/software it will be most productive to work as a team and to include the activity supporting the program's system software.

Many programs will have their Integrated Logistic Support (ILS) functions accomplished through one of the field activities and therefore another important activity to work with in enabling the SSB system. The engineering support efforts (i.e. In-Service Engineering Agent (ISEA), Technical Design Agent (TDA), Software Support Agent (SSA), Design Agent (DA), etc.) must be considered an integral part of the long term supportability solution thereby directly impacting the SSB efforts. Depending on the situation, many and in some cases, most of the important POCs you as the SSB system implementer will need to work with will reside at the prime contractor. These contractor POCs may include design engineering, logistics, purchasing, configuration management, reliability engineering, manufacturing, and others, but their involvement will depend on what was written into the contract. Again, the homework you did early on will come in handy, in understanding the contract requirements.

Implementation Experience:

One of the primary documents used to implement the SSB system is a complete list of the COTS items used in the program's system. In the SSDS MK-1 system we interfaced with the ISEA and the prime contractor to develop a complete list of COTS products. Although this task does not seem difficult it was more complicated than initially envisioned because certain items were purchased as COTS products then modified by the prime resulting in a prime generated part number on the Bill of Materials (BOM). Tracing down all the COTS products required the teamwork of the prime contractor, the ISEA, and the ILS functions. We experienced the same situation when dealing with the

MK-2 system, however in this case the prime contractor was the primary source with minor inputs from other functional areas. As an important side note, the list of COTS products and OEMs is a living document, which will change as more information is gathered and the knowledge of the Program's system increases.

Lessons Learned:

Implementing the SSB system requires the implementer to take a Systems Engineering approach in dealing with all aspects of the Program, and the POCs you will interface with may come from almost any area, such as contracts, logistics, engineering, financial business management, procurement, ISEA & TDA support, legal, etc.. Regardless of which functional area the POC you interface with comes from, the key to success will be effective communication to achieve understanding about the goals and objectives of the Program encompassing the long term supportability issues at hand. Since each community (i.e. contracts, legal, financial) has a language or unique meanings to concepts and words, it is important to learn how to appropriately address each subject to achieve a common understanding of your implementation efforts. This is not an easy task so do not take it for granted, that "what you meant to say is what they heard", ask for feedback and address concerns.

The knowledge obtained thus far in initiating a SSB system implementation effort will be helpful in formally documenting the roles and responsibilities of all groups and functions working as a team in support of the program. Each program's organizational structure and their approach and teaming membership may be quite different, therefore these aspect necessitate a unique and customized documentation package. From our implementation experience, most efforts require the development of a team charter and a management plan which is approved through the Program Management Office (PMO). The charter identifies at a very high level the goals and objectives for the group as perceived by the approving PMO authority. These high level guidelines provide the overarching objectives and constraints the working group must achieve. Enclosure (6) provides an example of the PMS 461 - SSDS COTS Working Group Charter. Since most of the requirements and objectives identified in this charter are at such a high level, they can apply to most any similar working group and can therefore provide a starting point

for your next implementation effort. Enclosure (7) is the SSDS COTS Working Group Management Plan, it identifies how the high level requirements were translated into specific structures, processes, and reporting requirements. These documents will take time and effort to prepare and once complete are available as a reference to the team, however the real value of this documented approach is when changes in team structure or membership take place. Having the documented guidelines, roles and responsibilities, processes, and requirements in this way identifies a constant baseline upon which a team can function during periods of disruption or change. In some circumstances it may be necessary to start at the very beginning, that is; each member must provide their perception of their position on the team and identify from their perception other member's positions along with every member's interface requirement. As each member briefs the team, the information and knowledge exchanged will help solidify functional and practical reasons for inclusion of each member. Sometimes there will be conflicts or duplication of effort but you are at the beginning of the effort and this is the best time to find out about those kinds of issues. Enclosure (8) is an example of a "Membership: Roles & Responsibilities Presentation" that was used during the formation of the 20X working group.

The efforts thus far have dealt with getting to know the Program environment, the people, and the interfaces, now you, as the implementer, must answer the question, "How much will this cost?". There is no way to avoid the question so answer it as honestly as possible. The issue in answering this question at the beginning is that you probably do not have enough information to provide a reasonable estimate because it depends on so many independent variables. These independent variables may include but are not limited to: 1) the age of the design, 2) the life cycle phase of the COTS products, 3) how many OEMs are involved, 4) how many COTS configurations, 5) how much support will you receive from the rest of the working group teaming members, 6) how long must the COTS items support the system, 7) what level of funding does the PMO consider appropriate, etc. So back to the sticky question - "How much?" – in the Implementation Experience section below are some rules of thumb used previously and these may prove valuable in constraining the boundaries of the cost risk as perceived by the PMO. For

example, the initial estimate, provided to each of the three programs we implemented the SSB system, was 1 ½ man years; 1 man year for programmatic interface and ½ man year for infrastructure. Although this estimate should not be used across the board it was acceptable to the programs for an initial estimate. Important to note is that our estimates were based on some in-depth knowledge of the programs we chose and the willingness of our local management to support us if it became necessary. Another approach to answering the –"How much?" – question is to identify an incremental time period to research some of the driving factors then to develop realistic estimates and propose them back to the Program. From our implementation experience, a three month exploration period will yield the most important information which will be useful to the support team, if the PMO decides to fund you or not, this makes the task 'value added' to the program regardless of the decision. Later on in this document will be examples of data collected that show a Return-On-Investment (ROI) proving the value added proposition of implementing the SSB system, these values should be used to provide a notional but realistic expected outcome of the effort.

Implementation Experience:

To initiate our implementation efforts we cheated as much as we could by assessing the programs we were already doing work for and by doing this we avoided a lot of uncertainty with regards to the people and the programmatic details. With this jump-start of information we still had much to find out about the COTS products. To put the problem into perspective the task to find the specific information that would be useful in future work included identifying: which configuration of the COTS items were being used, who were the manufacturers, how many of each configuration were in the system, and where the manufacturers are located. This was a mundane but daunting task. The SSDS MK1 system for example has a Bill of Materials (BOM) that is over 12,600 lines long and out of all these items, we identified 274 instances where COTS items were used. Because of multiple uses of a configuration, the 274 instances boiled down to only 49 significant items. We then evaluated the configurations and found that only 34 OEMs were involved. This evaluation and grouping effort required inputs from almost every team member and it was a critical element in making the overall implementation feasible

and the estimating process for future work possible. It took a little over a month to nail down a reasonable list that received consensus by the entire team. If we were to start from scratch to accomplish the same task we would probably ask for three months to produce a reasonable estimate.

Lessons Learned:

You will find out that, unless your program is extremely unique in this area, no one person, no single documentation package, or even a cross functional IPT will know all the COTS used within a medium size system. One of the prevalent problems is that in many instances COTS products are modified in hardware or software by the prime contractor to meet the systems requirements. Once modified, these products will receive a unique number assigned usually by the prime contractor, this action hides the COTS product in such a way that it is nearly impossible to extract usable information using automated methods. It is important for the program to identify these instances so that the risk of using the COTS products can be managed and even though the product has been modified it is based on the COTS product, which carries with it an inherent obsolescence risk. When developing a list of COTS items used in your system, dig deep and be ruthless in identifying every instance.

D. INFRASTRUCTURE: THE BACKDROP FOR SUCCESSFUL IMPLEMENTATION

Planning a successful implementation of the SSB system requires more than merely obtaining your Program's support, it will require a supportive infrastructure that is well thought out and structured in a way to allow future growth capability. The design of an infrastructure must support and reflect the goals for the SSB system. These goals are identified in the System Architecture (SA) document and are provided below for review:

1) To be able to identify, quantify, and mitigate supportability risks to the program.
2) Extend the life cycle and supportability of COTS
3) Provide infrastructure to support existing platforms/systems in support of the PMO
4) Achieve significant and quantifiable cost savings over the product life cycle
5) A reliable, affordable, repeatable and expandable process that meets the customer's performance expectations.

6) Institutionalized methods for proactive COTS management and DMSMS issues.
7) Leverage Navy and commercial supportability assets and provide a networked solution.
8) Leverage across Navy programs with extended applicability through contract strategies, methodologies and incentives to entice commercial industry participation.
9) Forecast budget requirements in support of the programs, warfighters, and consumer.
10) Improve schedule flexibility and support options of system upgrades or development initiatives.

The objectives of the SSB system are to provide long term relationships, preserve and protect intellectual property rights, and provide the interface management resulting in a long term COTS supportability solution. All of these goals and objectives must be supported through the infrastructure, that when developed may be completely transparent to the identified attributes. To develop such an infrastructure we have found it useful to partition these attributes into functional areas or tasks.

The support infrastructure, we have found useful, is composed of two functional areas: programmatic support and, for lack of a better word, infrastructure support. The programmatic support consists of three global functions accomplished through seven primary tasks identified below:

Programmatic Functions:

1) Interface with the Program Office & Infrastructure Team
2) Details pertaining to specific program characteristics -
   a. Number of systems
   b. Number of COTS assemblies used and location
   c. Insight into the prime contractors assembly call out
   d. Reliability numbers (i.e. failure rates, MTBF, etc.)
   e. Fielded systems concept of deployment and operation
3) Provide Recommendations
   a. Buy quantities
   b. Technology refresh intervals and interim support strategies.

Programmatic Tasks:

1) Obsolescence reporting
2) Provide purchase recommendations
3) Interface with OEM, SSB supplier and Program Office support teams
4) Involvement in applicable program activities
5) Identify and implement program specific flow-down requirements
6) Address quality issues (hardware/software, documentation, etc.) and interface with the OEM, SSB supplier, Program Office, prime contractor, etc.
7) Cost assessment based on Life Cycle Costs (LCC) and the unique opportunity to impact these costs through implementation of the SSB system.

The tasks and functions of the programmatic support point of contact (POC), have been and will continue to be, the focus of this SEDI model. Almost all the *Implementation Experience* and *Lessons Learned* documented in the SEDI model are to provide insight for the practitioner to ease the implementation burden. The examples provided in the enclosures may be used with minor modifications or in some cases directly applied by the programmatic POC. Even though the programmatic POC is critical throughout the SSB implementation process, this POC must rely on supportive structures provided by an infrastructure team. The inherent interdependency of the relationship between these two entities is crucial in providing the SSB systems functionality. Although both functions (programmatic and infrastructure) are of a technical nature, the programmatic POC handles the business and program issues while the infrastructure team deals mainly with engineering and configuration management issues.

The infrastructure team provides many of the capabilities identified in the goals and objectives for the SSB system, such as expandability, transportability, reusability, leveraging capability, configuration management and control, affordability and Life Cycle Cost assessments. The characteristics embedded within the infrastructure team incorporate traditional Sustainment Engineering, Integrated Logistic Support, and Configuration Management functions by employing a Systems Engineering approach as illustrated below. These functions are embedded within the approach but not duplicated by the approach, an important distinction that must not be overlooked. To illustrate this

point we will use the Sustainment Engineering function as an example. The Sustainment Engineering function, for all three programs we implemented the SSB system on, was performed by other field activities. In particular, the obsolescence analysis, at the piece part or assembly level, was performed by NSWC Crane; since this field activity has the in-house expertise, appropriate tools/methods and a successful track record of performance. By teaming with the Sustainment Engineering function at NSWC Crane we did not need to develop such a capability but instead we were able to leverage this Navy asset for the good of the programs. In performing our function in implementing the SSB system we brought the piece part or component list of the COTS assemblies to NSWC Crane for analysis. These lists provided insight into the COTS assemblies obsolescence issues whereby identification, assessment, and management of the obsolescence risk to the programs could be evaluated. The risk management capability is a new characteristic, which emerges through the combined efforts of Sustainment Engineering and implementation of the SSB system and unachievable using either or both systems independently. The scope and breath of the infrastructure team will depend on how you intend to execute the needed functionality. It will also depend on if the needed functions are performed in-house or provided through a teaming relationship as described above. Regardless of the type of structure you design into the infrastructure team the following lists of functions and tasks should be accomplished or covered:

Infrastructure Functions:

1) Interface with the programmatic POCs
2) Establish and maintain the OEM/SSB supplier relationships
3) Develop a database with appropriate controls and access rights
   a. Creation of the database structure
   b. Define methods for updating data and controlling access rights
   c. Provide mechanisms for continuous maintenance
4) Provide a central site to enable open and private communication (i.e. specific server location, web site, bulletin board, etc.)
5) Perform analysis on the data gathered
6) Coordinate with all support activities where applicable through programmatic POC (ISEA, TDA, SSA, DA, etc.)
7) Report findings or status

8) Coordinate with other programmatic POCs that could be affected by the reporting results

9) Perform on-site reviews at the SSB suppliers to assure schedule, cost and quality performance is maintained.

Infrastructure Tasks:

1) Database Management

   a. Program generated, prioritized, COTS lists, at the assembly level

   b. OEM provided, component piece parts lists and drawings detailing the make-up of the assembly level: Cautionary Note – These parts lists and drawings supplied through the OEM are obtained through entering a Non-Disclosure Agreement (NDA) and therefore necessitates special handling along with restricted access.

   c. Development of a relational database; Design, Management, and Maintenance

   d. Informational query and data extraction

2) Obsolescence Risk Management

   a. Receive COTS assemblies list from programmatic POC

   b. Perform assembly level obsolescence health/risk at that level

   c. Retrieve from the COTS OEMs the component piece parts list for each assembly.

   d. Filter the component piece parts list and condense list to active components for which predictive obsolescence tool are readily available and used as industry standards. Exceptions to this filtering process are handled on a case-by-case basis.

   e. Perform a piece part level obsolescence health/risk analysis at the component piece part level.

   f. Prepare an Obsolescence Risk Report for the program in an agreed upon format, by working with the programmatic POC

   g. Perform continuous monitoring of the component piece parts by reviewing impact of ongoing obsolescence notices posted by the component piece part manufacturers.

3) Interface with OEMs and programmatic POCs

   a. Initiate the relationship with the Original Equipment Manufacturers (OEM) and act as the primary interface with them throughout the life of the SSB system.

   b. Initiate the relationship with the SSB suppliers and act as the primary interface with them throughout the life of the SSB system and perform on-site reviews of SSB suppliers using an IEEE 1722 type evaluation.

c. Interface as required with other program support activities (i.e. ISEA, ILS, TDA, etc.)

d. Teaming with the programmatic POC and the other program support activities, define and document the expectations and required support from the infrastructure team. Typically these expectations and requirements are embedded in a Statement of Work (SOW), a tasking document, or in a Memorandum of Agreement/Understanding (MOA/U) between the implementing activity and the Program Office. Examples of these types of documents are available in Enclosure (9) – "Tasking Documentation".

e. As opportunities emerge, the infrastructure team is responsible for the interface with other activities such as other field activities, professional societies, government initiatives, industry working or focus groups, etc. that provide potential improvements or impacts to the SSB system and its implementation.

E. TEAMING: THE ENGINE OF IMPLEMENTATION

The functions and tasks described in the preceding portions of this document identify some of the primary areas your internal local team must accomplish and even though the list is extensive it is not an all-inclusive list. There are many approaches to teaming (i.e. Tiger teams, working groups, functional teams, project teams, etc.) that may provide the needed mechanisms to support the SSB system. However, because the objective in initiating the SSB system will require development of tools, methods, and processes to implement the system, an Integrated Product Development (IPT) environment is recommended. During our implementation experience we found the IPT approach established a firm foundation that structured the resources and leveraged the available assets. Most of the individuals on our local team had previous IPT experience so we did not need to start out with teaching them basic IPT skills. For the few members with no previous experience it was – "Trial by Fire" – through On-the-Job training; an experience less than optimum but still doable. If this will be your first encounter with functioning in an IPT environment we recommend formal training as a way to expedite the learning process. As identified in the functions and tasks descriptions provided earlier, every functional position on the IPT relies on all the other positions and must be worked simultaneously and with a high degree of coordination, to keep the tasks on track.

Formation of the SSB IPT was done only after buy-in from the local management had been received. To receive this buy-in, required several steps that are briefly outlined here to provide the implementer with a possible roadmap.

1) Initial presentation of the SSB system, see Enclosure (1)
2) Provide additional reading material, see Enclosures (2), (3), & (10)
3) Develop a project plan for SSB system Implementation, see Enclosure (11)
4) An informal request for resources to stand up the proposed IPT

Establishment of the SSB system IPT was initiated by gathering up the requested candidates and presenting all the materials provided to the management to gain endorsement then receive each member's buy-in. The next steps in forming the IPT was to develop the Mission & Vision statements (see Enclosure (12)), a set of roles and responsibilities (i.e. secretary, Leader, etc.) (see Enclosure (13)), and define the team norms and ground rules (see Enclosure (14)). With these baseline documents in place the team then defined our internal structure to meet the functional and tasking requirements. This led to the formation of two sub-teams: the Programmatic Team and the Infrastructure Team. The sub-teams formed along these functional boundaries helped in providing communications paths in the functional area, however each sub-team was given the caveat that the entire SSB system implementation is the primary focus of the IPT and sub-IPTs must support that overarching goal.

Implementation Experience:

Our IPT chose to have identified positions within the team (leader, secretary, etc.) and split or decompose the functions into two teams. The group was a small team composed of four team members on the infrastructure team that were local plus four remote members from another field activity (NSWC Crane), also there were three members on the programmatic team. Something to think about is the issue of conflict resolution. In our case the usual manner of handling conflict took place within the context of the norms or ground rules for the IPT but not always. The primary architect of the SSB system, took the team lead of the IPT and was asked to mediate or provide guidance in some situations thereby acting as the "final word" or "last stop". This "final word" acted as a process control typically used to remove a "stumbling block" or

"break a log jam" whereby the process could keep moving forward. Most of these instances required a short term decision that would have long term impacts therefore in our unique situation it seemed natural to depend on the lead architect. When setting up an SSB system it may prove useful to designate an individual to act in this primary architect or team lead position because your implementation will also be unique in its own way.

Lessons Learned:

Working within an IPT environment where tasks are highly coupled and inherently dependent on one another, it is important to keep a vigilant, watchful eye out for the team's response when errors occur. When mistakes or errors occur the perturbations are felt in almost every team product and team members are real sensitive about the impacts to their work. There will be no way to avoid the domino effect of a mistake and therefore the entire team must put extra effort into placing a positive spin or positive challenge to the remedy of these errors. The IPT environment encourages its members to share risks and in taking risks, some mistakes will be made, expect them, over come them as a team, and the result will be a creative robust teaming environment.

F. SUMMARY:

Lets take a minute and summarize what your implementation efforts, so far, have addressed and assess how these steps will help your future efforts in bringing the SSB system to life. Thus far we have defined the purpose, objectives, expectations and approach in implementing the SSB system. We have discussed various methods and approaches in obtaining buy-in from both the local management and the target program(s). The function and task descriptions have been identified for an infrastructure to support an SSB implementation along with development of the tools and methods to enable the IPT environment including: Mission & Vision, Roles & Responsibilities, and Norms & Ground Rules. All the aforementioned materials lay the ground work for the actual implementation efforts covered in Section 2: The Practitioners Manual. It is important to understand that the actual implementation efforts, can and often do, happen concurrently with development of the foundational activities described in Section 1:

Initiating and Management of an SSB system, the impact of the of your foundational work will be evident during the actual implementation process.

III. SECTION 2: THE PRACTITIONERS MANUAL:

This section of the SEDI was prepared to provide implementation details regarding the SSB system and the unique value added tasks. This description will illustrate, that when combined with Sustainment Engineering, ILS, procurement, and other program support function, the new support system yields a risk management method for long term supportability of COTS products contained in Navy systems in all phases of their life cycle, from design to fielded systems. The Practitioners Manual is partitioned into two major subject areas: Defining the COTS assembly list and prioritizing it with respect to programmatic impact, and the "17 Steps" – SSB Implementation Process identifying concurrent and sequential activities. The following methods, tools and processes are embedded within these subject areas: Reporting Status of the COTS prioritized list and the "17 Step Process", Obsolescence Health/Risk Reporting, Purchase Recommendation for Obsolete components, and database management requirements. These implementation tools, processes and methods, can and usually are, concurrent activities with the events described in section 1 – Initiation and Management of a SSB system. The programmatic POC is the active participant using "The Practitioners Manual" as a roadmap during the implementation process. The functions and tasks of the programmatic POC are outlined in section 1 of the SEDI and will require the POC to focus on communication, teaming, negotiating, and partnering skills to yield a successful SSB system implementation.

A. DEFINING THE COTS ASSEMBLIES LIST

The path to a successful SSB system implementation begins with knowing what to implement the system on and what impact the process will have on the program(s). This process will require coordination with every major player in the PMO and all the support activities and functions. The importance in defining an accurate comprehensive COTS assembly list cannot be overstated because it will be the basis for defining how all other SSB system implementation activities and plans are to be accomplished. Since the definition of COTS will vary from application to application the process of identifying those items that fit into the COTS category, will be an iterative and recursive learning

process. During this process, as the COTS list matures and becomes more accurate and complete, it provides a communication tool that further refines the understanding of the implementation task from the perspective of the team and from your perspective. This process will help identify the SSB system participation with respect to the overall support efforts.

The best starting point in developing an adequate COTS list will depend on the program, the application, and the customer's expectations. Typically a program will have several different kinds of lists of hardware and software, at various stages of indenture and description. It will be necessary to understand the meaning of the list and how it fits within the overall system being studied. Some of the more common types of lists include: the Configuration Management List, the As-built Configuration List, and the Bill of Material (BOM). For our purposes we will refer to the main source in developing the COTS list as the BOM even though it is only one of the potential sources of data. In some cases you will receive several lists that together should make up most or all items of interest. It may appear that this part of the process should be straight forward, but on the contrary; collection of this data may take quite a lot of effort and absorb significant amount of time. The key in keeping the task manageable is to immediately start the iterative and recursive review and buy-in process. Usually what will happen is a list will be provided to you and will contain either too little or too much data. Your first effort is to assess and understand what information you now have and how it applies to the system under consideration. In the case of being supplied with too much data, you will need to filter out extraneous data whereby producing a condensed list of just COTS items. During this filtering process, interface with the primary team members (i.e. prime contractor, the design agent, the ISEA, procurement, and ILS) is very helpful. Regardless of how you accomplish the task or how careful you are, the list you create will be wrong. Don't worry about it but deal with it through communication. Use the first cut at the list as a communication device to all other team members requesting feedback and any additional information they (the team members) could provide. It will be enlightening to your efforts to find out that no two people agree on what should be on your list, it's level of detail or indenture, and the differing view points on the need to generate such a list. This

is the time to exert your leadership role in getting the SSB system off to a strong start so distribute the filtered list to the team and when you receive feedback – immediately revise and re-issue the list. This process, like many others in the SSB system, is iterative and recursive, so if you are waiting for the final-final product before initiating the next step in the process – don't - because you'll never get to the next step; be willing to deal with some data that is incomplete. The data you are collecting will continue to change throughout the process, however one saving grace is that there will be a subset of data (i.e. the predominate COTS items) that do not change; and this fact allows for the next step in the process to be initiated. In the case of too little data such as a particular item chosen because of the programmatic risks if limited to the singular item it may be a potential start to an implementation effort. However, unless a more encompassing task can be developed there will be no assurances, that the SSB system can effectively attain its full potential. It is important to remember that the purpose of the SSB system is to provide COTS long term supportability for the fielded hardware and incomplete implementation will yield an undetermined risk to the program's supportability plans for those COTS not identified on the COTS list and therefore not covered by the SSB system. As the SSB system implementer, you probably will not be able to drastically influence the approach the program support team will start with – too much or too little information – but your primary task at this point is to understand what you've received and what implication that data has on the SSB system effort.

Implementation Experience:

To illustrate the large differences, an implementer may expect, in generating a COTS list, a high level description of how lists were generated for the SSDS programs and the AN/AQS-20X program are discussed. The SSDS MK1 COTS list generation process started with evaluating the as-built configuration list (referred to as the BOM) that was provided as a 12,600 line excel worksheet. This was too much data and therefore required filtering, a time consuming process. About 2 days of work reduced the list to about 200 potential candidates for the first COTS list. During this process we realized that the MK1 and MK2 SSDS systems shared many of the same COTS Original Equipment Manufacturers (OEMs) and some of the exact configurations. It seemed

logical that a combined list could yield some leverage in subsequent process steps. In an effort to define the combined list we distributed the MK1 list to both program teams (SSDS MK1 & SSDS MK2) and requested feedback. The amount of feedback was almost overwhelming and the effort took about 12 revision/re-issue cycles. The result of the effort produced a combined list of about 115 configurations from 34 OEMs. The SSB systems implementation effort now seemed doable and reasonable with the additional advantage that these boundaries received both teams buy-in and consensus. In contrast to the SSDS program method in generating the COTS list, the 20X program was much different. During the first team meeting for the 20X support team, the prime contractor provided a list of COTS configurations and the associated OEMs. Although the list was small, about 20 configurations from 5 OEMs, it represented the majority of the COTS electronic products in the 20X system and received immediate buy-in from the team. It is important to note that this list was the initial list produced from drawing of the 20X system prior to baseline configuration for production, therefore this list was considered a "soft list" expected to change in support of the production baseline.

Lessons Learned:

Development of the COTS list for a program of interest is an important task, which lays the foundation for the subsequent SSB system's implementation efforts. This task is never complete and will require continuous monitoring and updating. The key to success during this development process is the iterative and recursive approach, which uses the list generating process (revise and re-issue cycles) as a communication tool to cultivate consensus within the team.

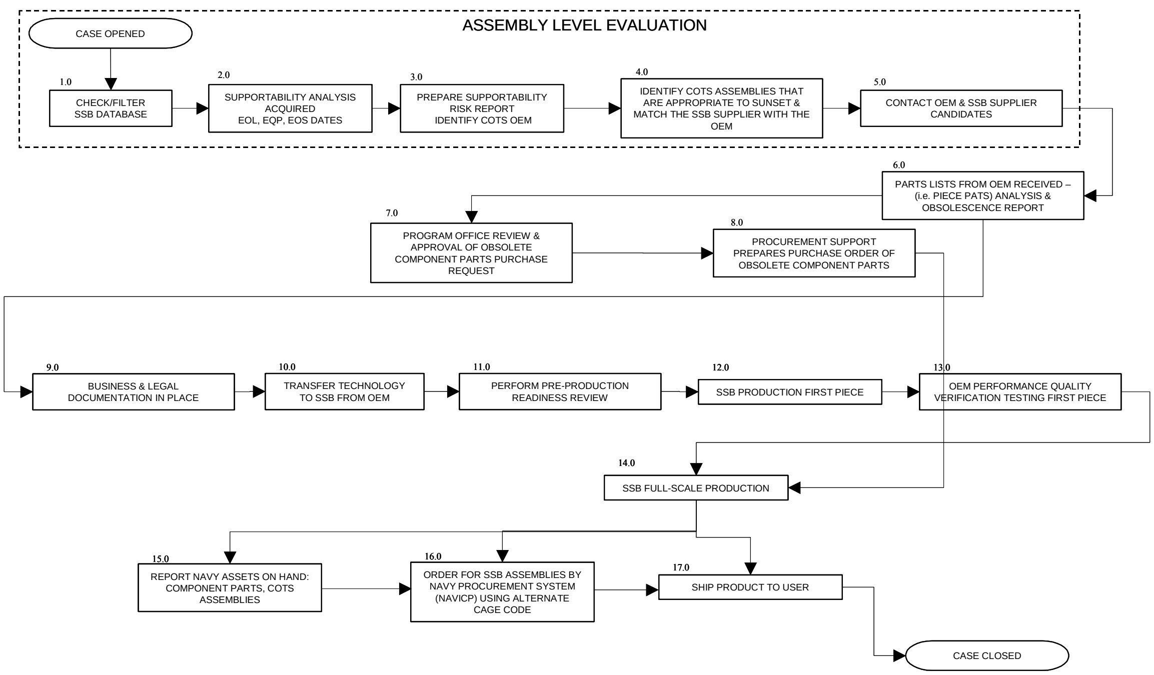
Defining the COTS list through consensus of the program support team should be complimented with an effort by the entire team to prioritize the list. This prioritization provides an implementation roadmap of appropriate sequential steps to guide the implementer's activities. Additionally, the priority identification provides guidelines that can be very useful during budgeting and funding activities. The prioritization activity typically takes place once the COTS list has reached some level of maturity where the changes in the list produce minor impacts. By this point in time the entire team is familiar with the contents of the list and some of the interrelationship that exists between

the items on the list and with the system in general. The activity in defining the priority for each item is a teaming function where all members must actively participate to yield an adequate product. The dependence of hardware to software is of key concern in assigning the priority levels. In some circumstances, some assemblies will be inherently linked to other assemblies such that a change to one impacts the other and therefore need to be grouped as like priority in the overall scheme of the list. Enclosure (15) provides the combined SSDS MK 1&2 prioritized, COTS list, in a state of maturity about half way through the process. During the development of this workbook there were several spreadsheets that were used to develop the all-up list described in worksheet 4. This worksheet illustrates the identified COTS OEMs, the configurations of interest, the points of contact at the OEM, the amount of assemblies needed for the next 10 years at a 50% and 99% confidence levels to show the potential buy quantities range, and implementation notes; all arranged in prioritized order. This worksheet was used extensively to communicate the what, who, how, and when regarding the SSB system implementation activities. Enclosure (16) presents the same workbook at a much later time, a review of spreadsheet 4 shows how this communication tool has been modified to give an update of the implementation process and identify actions and recommendations to the budgeting planning activities. Using these tools helps organize your efforts and aids in communication with the rest of the team.

B. THE “17 STEPS” – SSB SYSTEM IMPLEMENTATION PROCESS

The “17 Steps” SSB system implementation process was first described in the System Architecture as a method to describe and document the list of sequential steps needed to implement the SSB system. The “17 Steps” process is not meant to be a stand alone process; instead the process is intended to have the support of the tools, methods, and processes, identified in section 1 of the SEDI and preempted by a well defined prioritized COTS list. The “17 Steps” are used by the programmatic POC as the implementation roadmap and each step will require interactive participation with the program support team and the internal infrastructure team to produce the desired result. The prioritized COTS list becomes pivotal in starting the steps, due to the reliance on the list for identification of which OEMs are involved and the associated lower level of

configurations encompassed. The process is designed to be applicable to each configuration of assembly whereby the applicable steps are addressed independently for each step and each configuration. There are natural groupings such as all configurations from a particular OEM, in which, if the OEM chooses not to participate then all configurations are by default excluded. Barring unusual constraints on the implementation process implementation of the process steps takes place at the assembly configuration level and are independent of all other configurations. Figure 1 – "17 Steps" – SSB Implementation Process, provides a notional depiction of the process steps and is supplemented with – step definition. This figure and definitions are also provided as enclosures for use by new implementers to assure consistency and repeatability of the process (see Enclosures (17) & (18)). The purpose, objective and resulting output of each step impacts the implementation effort and will be discussed in detail.



Appendix B Figure 1: "17 Steps" - SSB Implementation Process

1. Case Open

The "17 Step" process flow begins with an initial statement - Case Open – to designate that there is a need to do some preliminary work before starting the process. The "Case Open" descriptor is dependent on first being able to define the COTS list and preferably having it prioritized before implementation. As identified in proceeding

paragraphs, the COTS list does not need to be finalized, only mature enough to be stable as a prerequisite in beginning the “17 Steps”. Other concurrent activities will most likely take place during the process step initiation, these other activities may include: infrastructure development, team formation activities, and program support team interfacing.

2. Step 1.0 – Check/Filter SSB Database

Steps 1.0 through Step 5.0 are handling the COTS items at the assembly level and the configurations are grouped by OEM. In this first step the new list of COTS assemblies are checked against the current COTS database to see if any leverage can be obtained due to previously accomplished work. The objective for this step is to identify the scope of work that still needs to be accomplished. The final result of this process step is to define the candidate list of COTS assemblies for further investigation. The resultant output from this step will fall into one of three categories: 1) the specific configuration and by default the OEM are already in the database whereby most of the work has been done the only remaining issue is to extend the current application to the new program of interest, 2) the specific configuration of interest has not been a sunset candidate however, the OEM has participated in the SSB system and a SSB relationship has been set up, leaving the next action in this instance would be to explore the possibility of the OEM to consider additional configurations, and 3) the OEM has not participated in the SSB system and by default no configurations have been considered.

3. Step 2.0 – Supportability Analysis Acquired (EOP, EOS dates, MTBF, etc.)

The purpose of this step is to identify at the assembly level supportability criteria that will help quantify the obsolescence risk presented by each assembly. The data elements that were found to most useful in characterizing the assembly supportability issues are:

1) Assembly level name, typically at the Lower Replaceable Unit (LRU) level
2) OEM cage code and name
3) OEM part number
4) Number of instances the LRU/assembly is used in the system under consideration.

5) Mean Time Between Failure (MTBF), this is an OEM supplied number, this number is necessary in calculating the required number of spares to support the system under consideration for a given length of time.

6) Cost of the assembly

7) End of Production (EOP) date, this date identifies the last date an assembly can be manufactured and therefore define the last time buy date

8) End of Service (EOS) date, this date identifies the last date an assembly can be repaired and identifies support risks, which may require additional procurement needs.

9) Forecasted number of assemblies needed to be available (purchased, in stock, etc.) in order to support the system under consideration for a specified length of time.

10) Number of years the system under consideration must be supported, this value is usually defined by the PMO or by the program support team.

The characteristics described in elements 1,2, and 4 (see above) and in some cases element 3, are extracted from the COTS list. The elements described in 5, 6, 7, & 8 are provided by the OEMs and require direct interface to obtain the information. Item 9 describes values which are calculated and are based on the normal exponential distribution of failure rates expected over a period of time and therefore can be translated into the number of item that need to be replaced over that period. The last item, element 10, describes the number of years the fielded system is expected to require support and is usually defined by the PMO as the interval until the next tech refresh date.

Implementation Experience:

For all three SSB implementation efforts we partnered with NSWC Crane and they (Crane) were responsible for collecting and providing the above data elements. The data elements collected through the interfacing with the OEMs presented some limitations and constraints that we later addressed. The two elements we found inadequate in addressing the programs requirements were: 1) the MTBF numbers were based on a calculated value and did not reflect our systems fielded environment, and 2) the forecasted quantity identified only the mean numbers of failures or 50% confidence level whereas the program support team desired to have a larger variety of choices, such as 75% and 99% confidence levels identifying the associated replacement buy quantities. To address the MTBF issue we obtained the actual MTBF exhibited by our fielded

systems. This data was provided from the Material Readiness Data Base (MRDB) at NSWC Corona. However, because the description of the assemblies and inconsistencies in reported indenture levels, our data request did not correspond with the data entered into the database, it therefore took several iterations to achieve realistic MTBF numbers. Since the MTBF number defines the amounts of funding and budgeting recourses to be used in future years it is critical to have the most accurate information available. To provide the most accurate data possible we teamed with the In Service Engineering Agent (ISEA) to evaluate the MRDB MTBF numbers then provide the program with recommendations. Enclosure (19) – Failure Rate Comparison Table, SSDS MK1 – provides an example in which we were able to compare the various databases with the exhibited failure rate seen by the ISEA when servicing the fielded equipment.

Lessons Learned:

The PMO will need a complete description of how the assembly quantities were derived and the distribution of those forecasted quantities, along with their relationship to meeting the support the fielded systems. The method used to calculate these forecasted quantities and the expected distribution over a given time period is defined in Enclosure (20) – Number of Spare Parts - Cost Justification Matrix – in a word document and the equations are embedded in the Failure Rate Comparison Table, Enclosure (19). These definitions and equations provide the logical methods that will help substantiate forecasted quantities which the PMO's decisions will based on. Your understanding of the these tools and adequate justification for the use of the MTBF numbers that are used will be pivotal in the PMO's decision making process.

4. Step 3.0 – Prepare Supportability Risk Report

The purpose and objective of this step in the process is to summarize and report to the program support team and the PMO, the supportability risk due to COTS products as evident at the assembly level. This high level summary is based on inputs from the OEMs and is retrieved through phone calls to the Marketing and Sales functions. Due to the methods in acquiring the data, the data has limited value due the capricious nature of the COTS industry. Although the data is not as solid as we wish it could be, the information gathered can help in planning at a high level, particularly if the data reflects

the current technology trends. Usually the program support team and the PMO will want to review and buy-in to the COTS list at this stage of maturity. Enclosure (21) – Technology Refresh Cost Model Demo – provides an example that identifies and reports the COTS expected life cycle and potential obsolescence risk at the assembly level. This presentation was prepared by NSWC Crane and is one of the services they supplied in evaluating technology trends. One of the most useful aspects of the assembly level report is the identification of the time line for specific assembly that shows that the product is scheduled to be obsolete in a particular time frame. These identified assemblies are potential candidates for the SSB system implementation.

5. Step 4.0 – Identify COTS Assemblies That are Appropriate for the SSB System

At this stage in the process, an extensive list of all different types of COTS products may be incorporated in the COTS list. Since the primary characteristic we focus our efforts on deals with microcircuits due to the high obsolescence risk involved, other non-microelectronic based products can be eliminated from the list. The filtered list will then be assessed for potential SSB system implementation candidates. Typically all assemblies are considered potential candidates for at least the first steps of implementation that involves establishing a working relationship. Removal from the candidate list at this point in the process is accomplished by exception only basis, examples of such exceptions include: the company is in financial trouble such as "Chapter 11", the assembly under consideration has a direct replacement that has been tested and verified, the assembly is performing poorly in the application and under investigation. Notional consideration is given to the potential OEM candidates and if an appropriate SSB supplier exists to partner with them or if the OEM already has partnered with an SSB supplier.

6. Step 5.0 – Contact OEM & SSB Supplier Candidates –

Initial contact with the OEMs and interfacing with the SSB supplier candidates is perhaps one of the most unique aspects embedded within the SSB system because the interchange of information between yourself and the OEM can be extensive. From the implementers perspective it is important that the OEM understands the basic concepts

behind the SSB system and the critical nature of the OEM's participation in the system. As a receiver of information from the OEM the implementer must get an understanding of the OEM's business environment, current policies and practices, and how the SSB system can be implemented through the OEM. The OEM will need to receive some logical reasons to peruse the potential implementation and have some kind of business case to justify such an effort. In most cases we found that initial contact over the phone, required follow-up actions such as emails documenting the concept and eventually a visit to the OEM's facility to present the concept in detail. The information regarding each company and all the configurations under consideration is extensive and will get confusing unless it is organized in a methodical way and the records are updated regularly and consistently. The example provided in Enclosure (15) - SSDS MK 1&2 prioritized, COTS list, illustrates the method that was used during the implementation process for the SSDS programs. Key information provided in this matrix is typically needed during almost every contact with the potential candidates. The matrix also has columns to annotate information already gathered and actions yet to be taken. In essence the matrix is used much like a sales persons contact list in providing important information that is continuously updated to reflect the ongoing communication with the customer. The objective in this step is to orchestrate the situation such that the representatives of the OEM, gain a comfort level with the SSB system concepts so that they feel they can endorse the company's involvement. If this level of comfort is achieved and if the decision makers were the ones you had presented to, the next steps in the process are usually completed immediately. However, if the decision makers were not present and the receiving individuals must check with their proper authority, they may act as your ambassador or ask you to return and present to the actual decision makers. If asked to return and present to the decision makers, our experience shows us that in every instance of a return visit, the company will chose to participate.

Implementation Experience:

During implementation we found this step was a people orientated and communication intensive where the discussions were very interactive requiring us to "think our way through" conversations instead of pre-planed responses. In contrast to

the conversations, the travel arrangements and meeting appointments, at times, required artful mastery of visiting 4 states in 4 days, attempting to keep within the closest geographical areas as possible. What made the arrangements so interesting is that the availability of the OEMs personnel dictated the planning and each OEM would make visit arrangements based on their constraints. The scheduling and planning skill to optimize the travel required to the OEMs constraints while meeting the programmatic constraints placed on anyone implementing this step of the process will be challenging.

Lessons Learned:

An excellent tool to help with producing productive communication to enable success for this step of the process is to leverage off of past conversations by keeping a running log of previously asked questions and answers. This log will never be complete but its use is to provide consistency and completeness. In arranging visits to the OEMs it is very helpful to group the OEMs by geographical area then prioritize within that area each OEM. This type of grouping will help coordinate the decision making process for travel arrangements.

7. Step 6.0 – Parts List from OEM Received – Analysis & Obsolescence Report

Receiving the assembly component piece part lists represents one of the most significant steps in the entire process. Establishing the relationship between the OEMs and the program needs, can now show tangible results through sharing of the OEM's intellectual property. It is important to review why these piece part lists are so essential to the obsolescence risk management process used in the SSB system. The COTS products are designed into our fielded systems based solely on their performance characteristics at the assembly level. The prime contractor/PMO does not pay for the intellectual data rights for the COTS products. The developmental cost associated with these products, are paid for by the OEMs and they control the configuration management and manufacturing processes. Only at the assembly level will the OEM be responsible to the customer (the prime contractor/PMO) in assuring repeatable performance in systems designed with the COTS product. Given this scenario the obsolescence risk experienced by the PMO is at the assembly level where interoperability and integration impacts can be

complex and expensive to resolve. In receiving insight into the assembly through the component piece part lists, we have for the first time the ability to mitigate the obsolescence risk at the piece part level. In resolving the risk at this lower level, the remedy cost will be much less due to the cheaper cost of the piece parts and circumventing the potential impacts to integration and interoperability. Therefore by obtaining the component piece part lists we are now able to manage the PMO's risk at the most cost effective and efficient level. In working through this part of the process a Non Disclosure Agreement (NDA) is usually signed by both parties to protect the intellectual property from distribution beyond the intended application as part of the SSB system. Enclosure (5) provides a general fill-in-the blank template NDA form however most companies already have a standard NDA form that they prefer to use. The NDA formalizes the OEMs buy-in of the SSB system and has prepared the way for the transfer of the intellectual property.

Once received, the component piece part lists must be translated into usable information before analysis, evaluation, and recommendations can be accomplished. The transfer process of the component piece part lists (hereafter referred to as – the parts list) will take many forms and be dependent on the OEM's business practices. The parts list may be provided via a web site, a fax, an email, or in paper hard copy form. In an effort to reduce the amount of work necessary to handle these parts lists we developed a preferred format that is supplied to potential OEMs. Enclosure (22) – Requested Format for Parts Lists – identifies this preferred format but cannot be required since we need to work within the OEM's standard business practices. Regardless of which format the parts lists are received in, we will need to filter out non microelectronic parts and specially format it so that it can be downloaded to the server database. When the formatting and filtering is complete the parts lists will need to be evaluated for obsolescence risk of each component piece part on the list. Although there are many commercial services and industry standard tools to perform this function we chose to partner with another field activity who performed this task. Our method for handling the parts lists at this stage in the process was to email the list to NSWC Crane and once the evaluation and analysis was complete it was emailed back to NSWC Corona. NSWC

Crane provided excellent service and when problems occurred, they worked with us to resolve every issue. The parts lists came in from the different OEMs at various times depending on the time of interface with the OEM and the response time from the OEM. The progression through this process was monitored through the use of a status matrix described in Enclosure (23) – Vendor Status Report. This status matrix was updated on a weekly basis and reported to the program support IPT as requested. On an annual basis or as requested by the PMO, the detailed information on all assemblies in the SSB system pertaining to a specific program are assembled into a single document and provided to that program as a SSB system update. Enclosure (24) – Obsolescence Health Report is the SSDS example of such a report. These reports are extensive since the following information is provided: the status of the SSB system implementation, the assemblies obsolescence health arranged per system indenture, a summary report of obsolete component piece parts (Red, high risk values), graphical depiction of the obsolescence health analysis, and executive summary for the system. The format and detail is dependent on the request or needs of the specific program, so before arbitrarily adopting the example format we suggest interfacing with your program before proceeding.

8. Step 7.0 & 8 – PMO Review & Approval of Obsolete Component Parts Purchase Request / Procurement Support Prepares Purchase Order of Obsolete Component Parts -

One of the products of the preceding step is a list of red coded piece parts identifying them a high obsolescence risk items. Enclosure (25) – SSDS Red Component List provides an example of such a list. These specific parts have been discontinued and soon will not be available for purchase. Our experience has shown that the availability of a part in the open market after the production has stopped is about 8 to 12 months, this time lag before all parts are bought up is referred to as the 'Grey Market.' It is important to purchase the obsolete parts while still in the early stages of the Grey Market because a \$20.00 part can raise in value to a \$2500.00 part as the component becomes scarce. The purchase of Grey Market parts will continue to be an ongoing function as new high-risk parts are identified. Depending on the impact, both risk and financial, the purchase of obsolete parts may be as simple as an email form (see Enclosure (26)) or as formal as a detailed report. Enclosure (27) – Analysis of Intel's i680 obsolescence on OEM products

– SSDS program – is a good example of how to structure a detailed impact and purchase request due to obsolescence. It will be important to automate this process as much as possible because there will be a continuous stream of these requests over the years the programs system need to be supported. Step 8 is included with step 7 because after the approval for the request is given (step 7) the approved request is passed onto the procurement activity to translate it into a Purchase Order to the SSB supplier. In turn the SSB supplier will receive the Purchase Order and go out to the open market and procure the obsolete parts subsequently storing them at their facility. This action of storing parts on the SSB suppliers shelves can take place immediately if the OEM agrees to take on the role of being its own SSB supplier. Our experience has shown that over 90% of the OEMs wish to implement using this method. With the in-house SSB relationship at the OEM, technology transfer is not an issue and there is no real impact to current procurement arrangements. However if the OEM chooses to transfer their technology to a third party SSB supplier, storage of procured part will usually need to take place after steps 9.0-13.0 are completed.

9. Steps 9.0 – 13.0 – Technology Transfer Roadmap –

Each of the steps described below are for the general case and of notional value only. However the process flow is provided as a guideline of major stages in the technology transfer process and can be used by the SSB system implementer as the identifiable stages to monitor. All five of these stages are accomplished by the OEM and the SSB supplier when intellectual property is transferred. This process is formalized through a binding contract between the OEM and the SSB supplier and completion of the process is as agreed upon by these two entities. The role the SSB system implementer plays in this process is to monitor the progress to assure availability of parts when needed by the program. A note of caution with regard to the technology transfer process: if you as the implementer have not had experience performing the tasks described below and are asked to help implement the transfer process be extremely careful because this process is tricky and very difficult to perform successfully. There are internal Navy assets (NSWC Corona & NSWC Crane) to help you accomplish this task and mentor you through the

process, so if you need the help ask for it. Short descriptions of each of the major technology transfer stages are as follows:

a. ***9.0 Business & Legal Documentation in Place***

Development of the contract language, terms and conditions, methods and processes for reporting, payment of royalties, expectation of business structures and handling of Intellectual Property rights are some of the more important issues covered. The only input the SSB implementer should have in this stage is to ask that a clause be placed in the contract to allow a third party to obtain a component piece parts list of each assembly to assess the obsolescence risk.

b. ***10.0 Transfer Technology to SSB Supplier from OEM***

Typically the two companies will handle this process between themselves however on occasion to enhance communication or facilitate the transfer one or both companies will ask for participation from the SSB implementer. If this happens be careful if you become involved, you carry no contractual weight and must stay at a distance if a dispute occurs. A good implementer is invaluable during this process so if you need help ask for it. During this stage the implementer is there to monitor progress and enable the process but not become embroiled in disputes between the primary parties.

c. ***11.0 – Perform Pre-Production Readiness Review***

This function will be performed by the OEM with the possibility of the SSB implementer present as a casual observer. The implementer's function here is to monitor and observe.

d. ***12.0 – SSB Supplier Production of First Piece***

Evaluation of first piece production is a standard industry practice to assure the quality of the production processes, methods and practices have been adequately transferred. This quality function is performed by the OEM. The implementer's function here is to monitor and observe.

e. *13.0 – OEM Performs Quality Verification Testing of First Piece*

The verification testing of the first piece of production is different from the previous evaluation in that it is a process control for the adequacy of the testing methods and equipment. When possible the OEM will use the original test equipment at their facility to cross check the SSB suppliers test set up. Again, the implementer's function here is to monitor and observe.

10. Steps 14.0 & 15.0 – SSB Supplier Full-Scale Production / Assess Government Assets–

Although there are two primary paths to get to this point in the process – to sunset the technology within the OEM's facility or to transfer the technology to a third party SSB supplier – the end result should be the same. Once the SSB system is in place within a production facility there will be three ongoing requirements for which the SSB system implementer will participate in. The first of these requirements is the ongoing evaluation of the component piece part obsolescence risk assessment and the subsequent purchase requests for new obsolete parts. The second function in which the SSB implementer participates in is the independent assessment and reporting of Navy assets on hand at the SSB supplier. This assessment, required is by the Federal Acquisition Regulation (FAR) to be done annually at a minimum. The third function is actually performed by the SSB implementer or a designee, and requires them to assess the health of the SSB supplier using tools similar to the IEEE 1722 evaluation matrix which is an industry "Best Practice" evaluation tool. This annual assessment will focus on the overall health of the SSB supplier covering the following major areas: financial, technical capability, technical support, materials and configuration controls, past performance data and cost containment or growth.

11. Steps 16.0 & 17.0 – Ordering and Shipping of Assemblies –

The SSB system has been designed to work within current Navy procurement structures in support of the Navy Procurement System (NAVICP) and directly to the end user if that path has been already defined. The one issue the SSB implementer must address is that if a third party SSB supplier has been brought into the situation, then an

alternate cage code for the sunset item needs to be generated. This alternate cage code allows the procurement system to purchase directly from the new source.

IV. SECTION 3: MEASURING & ASSESSING THE SSB SYSTEM:

This final section of the SEDI plan identifies methods and metrics to measure the impact of implementing a SSB system, thereby providing adequate indicators for the programs to assess the effectiveness and value proposition in using the system. Implementation and establishment of a SSB system can be partitioned into three separate measurement areas that necessitate the use of different measurement or assessment tools in each area. The first measurement area involves the assessment of the relationship between the OEMs/SSB suppliers and the implementing program. The second set of measurements, deals with the data extraction and information transfer tasks such items as transfer of component piece part lists – transferring and assessment. The final area of interest for measurement and assessment is the transformation of the collected data into support criteria directly applicable to the PMO supportability planning. Each of these areas requires different types of metrics and all areas are measured concurrently to achieve a robust assessment of the COTS obsolescence risk. Continuous and/or periodic monitoring in all three areas is encapsulated as part of the SSB system design.

Relationship building and partnering with the supplier base is a value added function for the PMO in defining opportunity and managing risk. The risk management aspects of effort extend beyond just obsolescence, many other types of risks must be evaluated such as: financial risk – is the supplier financially solvent, business risk – how are mergers going to effect the support efforts, business planning risks – what do future business opportunities look like and with that knowledge is the company willing to support the PMO's program, perception risk – is the company perceived as supportive or are there negative connotations associated with the company. Identifying and assessing these kinds of risks are part of the relationship building process and these types of issues need to documented and reported. The program will want to know this information and also the subjective risk assessment as perceived by the SSB system implementer and potential impacts to the program. During our implementation efforts we instituted two standard methods to document the relationship and partnering information we gathered.

In an effort to document the information obtained through interfacing with the OEM/SSB suppliers we instituted the SSDS MK 1&2 prioritized, COTS list. Enclosure (15) provides an example of the list in the early stages of maturity. The list contains basic information about the OEM, points of contact, assembly configurations of interest, and approximate quantities. The utility of the list is greatly enhanced by the additional columns that describe implementation details, company and product information, and the ongoing list of actions to be taken by the company and by the implementer. The information documented in this manner was extremely useful during program reviews in addressing or raising risk issues. We continually shared this contact list with the entire program support team. Although not quantitative in nature, this risk reporting devise received the team's endorsement as a good communication tool. Another use for the list was developed to communicate the most current state of the relationship building efforts and then provide recommendations to the PMO in support of a Funding Allocation Review (FAR) decision-making process. Enclosure (16) - SSDS MK 1&2 prioritized, COTS list, Budget support: illustrates how the various descriptions and assessment of risk are combined in support of a recommendation to the PMO. In conjunction with the contact list another tool was developed to provide the program support team and the PMO with insight to the SSB system implementation process. This insight was documented in a matrix that related the specific OEM assembly configurations to the "17 Step" implementation process. This matrix provides an implementation assessment in easily interpreted graphical format that represents a snapshot of "work in progress". Enclosure (23) – Vendor Status Report – is an example of a status report, which was generated for the SSDS MK1 program. This report was very useful in communicating to all involved parties the progress of the implementation efforts. Another assessment tool currently under development is an assessment tool for evaluating the SSB supplier ability to maintain continued support year to year. The tool is based on the IEEE 1722 assessment matrix, which is an industry standard for performing these types of evaluations.

The second set of measurements involves the transferred information gathered from the OEMs and subsequent evaluation and analysis of that information, as a result of

the implementation process. This set of tools yields objective and quantifiable obsolescence risk assessment of the COTS products used in the fielded hardware. Individual assembly assessments are combined in an indentured approach modeling the fielded system's configuration. The assessments are then rolled up to the next level of indenture and finally to the system level. An obsolescence health assessment is identified at each level of indenture. Other salient data/information is provided to provide context to the analysis being reported. Enclosure (24) – Obsolescence Health Report – is a report submitted for the SSDS MK1 program and provides an example on how to illustrate the combined analysis efforts to communicate to the PMO the assessed system obsolescence risk due to COTS products. An extract from this report identifies the component piece parts that represent a high obsolescence risk – RED Coded parts. Enclosure (25) – SSDS Red Component List – is an extract from both MK1 & MK2 systems and provides an example to illustrate the immediate treat to the program's ability to support the fielded systems. The format and content of these types of reports are highly dependent on the PMO's needs and desires therefore the subject should be negotiated prior to the development of the report.

The last area of measurement and assessments is the 'Capstone' of the entire SSB system's implementation effort. It brings together all the information and data collected and provides functionality previously unattainable without the SSB system - Systems Engineering approach. The 'Capstone' assessment tool is illustrated in Enclosure (28) – SSDS Assembly Master & Cost Matrices. Every tool, method, and process developed to implement the SSB system is either directly or indirectly responsible for the numbers evident in the matrices. Enclosure (29) – SSB Planning Excel Workbook & Data Item Description - provides detailed explanations for the descriptions of each cell along with the mathematical relationships and constraints implemented within the worksheet. Important to understand that without implementing the SSB system the options are limited to Life of Type Buy (LTB) or Other - an identifier for options which are typically resource intensive, cause changes to the configuration baseline that cause perturbations in the support structures, or are limited in scope to specific situations unique to the application. Only the SSB system provides a systematic process to adjust to budget

constraints while providing the highest level of supportability possible. The matrices are defined with built in algorithms that allow the user to perform “What if” scenarios so that the most optimum practical support approach can be developed. The most important metrics from the PMO perspective are the cost numbers given different alternatives and the inherent risk associated with those figures. The cost matrices tool gives the PMO the capability to model and simulate prior to making decisions and when combined with new support options available through the SSB system increases the probability of success in long term supportability of the fielded systems.

V. LIST OF REFERENCES

1) Glum, Ted (2000). Support for the Warfighter. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

2) Robinson, David G. (2000). DSCC DMSMS Management. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

3) Hartshorn, W.T. (2000). Obsolescence Management Process as a Best Practice. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

4) McDermott, John T. (2002). Reducing the Impact of Obsolescence in Military Systems. In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

5) Plotkin, Martin S. (2000), A New Industry – the Emerging DMS Market, COTS Journal, Volume 2 Number 7, pages 33-35

APPENDIX C: BUSINESS CASE ANALYSIS

Implementation of the Sunset Supply Base Process
for the Navy's Ship Self-Defense System (SSDS)

Projections for 2002-2012

THE SUNSET SUPPLY BASE: LONG TERM COTS SUPPORTABILITY, IMPLEMENTING AFFORDABLE METHODS AND PROCESSES
by
Michael E. Barkenhagen Michael W. Murphy
March 2003
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ABSTRACT

This Business Case Analysis (BCA) is one of the four foundational documents created to establish the Sunset Supply Base system as a Commercial off the Shelf (COTS) supportability alternative for Navy fielded systems containing COTS products. This BCA focuses on the Sunset Supply Base system for supporting Commercial Off The Shelf (COTS) products as they are used in the Ship Self-Defense System (SSDS) MKI. The Sunset Supply Base (SSB) concept is intended to extend the supportability of COTS products used in Navy weapon system programs. This BCA will consider the consequences of implementing the SSB infrastructure for providing COTS support for the SSDS program. These consequences, which will include both tangible and intangible results, will be analyzed for conformance to DoD policy, program requirements and overall cost/benefit. Furthermore, it will look at how well the actual implementation relates to the goals and objectives of the SSB. In short, this business case will examine the likely costs and benefits that will result in implementing the SSB system for supporting the SSDS program.

The nature of the SSB thesis topic and the approach taken by the authors necessitated the use of examples, templates, tools, methods, and practices. These implementation tools and deliverable products are illustrated through a set of enclosures referenced in the thesis and its appendices. Most of the enclosures are static examples generated during the implementation of the SSB system on three Navy programs. However, other enclosures are not static and are therefore provided on a web site (URL: http://www.anavision.org/ssb.htm) in the Excel format to provide a dynamic model for use by an implementer of the SSB system.

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LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS

F	Expected Mean Failure
n	Number of parts for all systems
λ	Failure rate over time
$\hat{\lambda}$	Maximum Likelihood Estimator (MLE)
$\hat{\lambda}_{\mu}$	Upper Confidence Limit
$P(\lambda, T_0)$	Probability of Occurrence, Poisson Process
$P(T_0 > t)$	Probability of occurrence prior to the maximum time
%	Percent
α	One minus the probability
χ^2_{α}	Upper tail of the Chi distribution
T	Total hours of Mission Time
T_0	Accumulated time
R(t)	Reliability as a function of time
$e^{-\lambda t}$	Reliability expressed using the exponential distribution – a function of failure rate over time
17 Steps	SSB System Implementation Process
$K	Cost represented in thousands of dollars
$M	Cost represented in millions of dollars
AN/ASQ-20X	Designator for Sonar Mine Detecting Set developed for the Navy under the program management code PMS-210
BCA	Business Case Analysis
BOM	Bill of Material
CARA	COTS Availability Risk Assessment
CBS	Cost Breakdown Structure
CLS	Contractor Logistic Support
COTS	Commercial Off the Shelf
COTS/NDI	Commercial Off the Shelf/Non-developmental Item
DAD	Defense Acquisition Deskbook
DAU	Defense Acquisition University
DMSMS	Diminishing Manufacturing Sources and Material Shortages
DoD	Department of Defense
DoDD	Department of Defense Directive
DoD-STD-480	Department of Defense Standard Document 480: Configuration Control -- Engineering Changes, Deviations and Waivers
ECP	Engineering Change Proposal
EOL	End of Life
EOP	End of production date
FAR	Federal Acquisiton Regulations
FY	Fiscal Year
GAO	Government Accounting Office

ICP	Inventory Control Point
ID	Identification
IEEE 1722	Capability Assessment Tool
ILS	Integrated Logistics Support
IPT	Integrated Product Team
ISEA	In-service Engineering Agent
ITIMP	Integrated Technical Item Management and Procurement System
JALB	Joint Aviation Logistics Board
LCC	Life Cycle Cost
LTB	Life of Type Buy (also referred to as LOT Buy)
LTB(1)	Support scenario worksheet using Life of Type Buy (LTB) as a primary method
LTB only	Support scenario worksheet using Life of Type Buy (LTB) exclusively as a support method
MAX	maximum
MIL-Spec	Military Specifications
MIN	minimum
MKI	SSDS Mark I System
MKII	SSDS Mark II System
MLE	Maximum Likelihood Estimator
MOA	Memorandum of Agreement
MOE	Measure of Effectiveness
MOU	Memorandum of Understanding
MRDB	Material Readiness Database, Fleet captured actual failure data
MSP-Plus	PBL-MSP with MIN/MAX stocking requirements
MTBF	Mean time between failure
MVUE	Minimum Variance Unbiased Estimator
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command
NDA	Non-disclosure Agreement
NDI	Non-developmental item
NPV	Net present value
NRE	Non-reoccurring engineering cost
NRFI	Not ready for issue
NSWC/Crane	Naval Surface Warfare Center, Crane Division
NSWC Port Hueneme	Naval Surface Warfare Center, Port Hueneme Division (ISEA for SSDS)
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
# parts	Number of parts
Part #	Part Number
PBC	Performance Based Contracting
PBL	Performance Based Logistics
PBL-O	Performance Based Logistics Organic

PBL-C	Performance Based Logistics Contractor
PBL-MSP	Performance Based Logistics – Mini Stock Point
PBL-P	Performance Based Logistics Partnership
"Full"-PBL	Performance Based Logistics – Contractor exercises full control
PHS&T	Packaging, Handling, Storage and Transportation
PM	Program Manager
PMO	Program Management Office
POC	Point of Contact
POM	Program Objective Memorandum
QDR	Quadrennial Defense Review
RAM	Reliability, Availability and Maintainability
RDA	Research, Development ans Acquisition
RFP	Request for Proposal
ROI	Return on Investment
SCWG	Ship Self Defense System (SSDS) COTS/NDI Working Group
SEDI	Systems Engineering Development and Implementation Plan
SME	Subject Matter Expert
SOW	Statement of Work
SSB	Sunset Supply Base
SSB(1)	Support scenario worksheet using Sunset Supply Base (SSB) as a primary method
SSB only	Support scenario worksheet using Sunset Supply Base (SSB) exclusively as a support method
SSB Optimized	Support scenario worksheet using Sunset Supply Base (SSB) wherever possible as the method of support
SSDS	The Ship Self Defense System developed for the Navy under the program management code PMS-461
STD DEV	Standard Deviation
TDA	Technical Design Agent
TOC	Total Ownership Cost
Unique ID	Unique identifier
WBS	Work Breakdown Structure

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I. EXECUTIVE SUMMARY

This Business Case Analysis (BCA) focuses on the Sunset Supply Base concept for supporting Commercial Off The Shelf (COTS) products as they are used in the Ship Self-Defense System (SSDS) MKI. The Sunset Supply Base (SSB) concept is intended to extend the supportability of COTS products used in Navy weapon system programs. The concept is unique in that it takes an After Market approach to supporting COTS due to Original Equipment Manufacturer (OEM) discontinuation of items presently or planned to be used in Navy weapon systems. The Sunset Supply Base concept offers a support infrastructure, which may include third party support to bridge the gap between industry business objectives and the Navy's requirement for long-term system support.

The current DoD requirements include a scenario of increased operations while at the same time a continuous push for weapon system upgrades. Given the present pressures for reducing costs, DoD Program Management Offices (PMO) are challenged to search for more economical alternatives. The challenge, in effect, is to maintain near-term weapon system readiness while at the same time planning for weapon system modernization efforts. Furthermore, technology evolution is being driven by the commercial sector and no longer by the DoD. The DoD looks to the commercial sector for technology concepts to transfer to their warfighter. As a result, the DoD has established a COTS initiative to deliver state-of-the-art technology to the warfighter faster and cheaper. The emphasis on COTS product usage was brought on by the fact that the DoD could conceivably take advantage of technology developments in the commercial sector at a reduced cost to development programs. With COTS products come additional challenges in support, given the fast paced technology update cycles in the commercial sector as compared to the slow and methodical DoD acquisition processes. Thus, there is an anticipated increase in material or product obsolescence. Presently, the commercial sector has technology refresh cycles of 18-24 months[1) Glum, 2) Robinson, 3) McDermott], after which time the product is typically discontinued. The DoD on the other hand takes a purposely conservative and methodical approach in terms of planning and budgeting. Additionally, the DoD design, develop and implementation process typically exceeds 5 years.[3) McDermott] This misalignment has lead to significant challenges in maintaining system baseline stability. There is also little incentive for the Original Equipment Manufacturers (OEMs) to accommodate the DoD requirements since the DoD only makes up roughly 0.4% of the market share.[1) Glum, 2) Robinson, 4) Hartshorn]

To address these issues, this document establishes specific goals and objectives for the SSB system and then through careful and thorough analysis, derives benefits for alignment with current Naval business needs. Based on this alignment we advocate the implementation of the SSB architecture to provide dependable, cost effective supportability insurance for COTS based weapon systems. The SSB process focuses on obsolescence issues and material shortages associated with COTS usage in military weapon and support systems. Addressing these specific areas, the SSB provides an opportunity to extend COTS supportability in an effort to stabilize the weapon system baseline. Generally speaking, the purpose here is to show how the SSB system meets the needs and expectations of the Navy's acquisition process by evaluating its implementation on the SSDS MKI program. The period of analysis is between fiscal year 2003 and 2012. The data obtained for this case study was collected in FY 2002 and applies to SSDS MKI program execution beginning in FY2003.

The results presented in the *Analysis* section of this document illustrate how the SSB implementation provides significant cost savings to the SSDS MKI program in terms of total support. Furthermore, this Business Case Analysis also demonstrates how the SSB infrastructure is an affordable approach for mitigating program supportability risk and can directly support other existing combat/weapon systems. To this end, it provides the PMO an additional support solution alternative for meeting the challenge of maintaining weapon system readiness and warfighter requirements in the most cost effective method possible.

The nature of the SSB thesis topic and the approach taken by the authors necessitated the use of examples, templates, tools, methods, and practices. These implementation tools and deliverable products are illustrated through a set of enclosures referenced in the thesis and its appendices. Most of the enclosures are static examples generated during the implementation of the SSB system on three Navy programs. However, other enclosures are not static and are therefore provided on a web site (URL: http://www.anavision.org/ssb.htm) in the Excel format to provide a dynamic model for use by an implementer of the SSB system.

II. OVERVIEW

A. SUBJECT STATEMENT

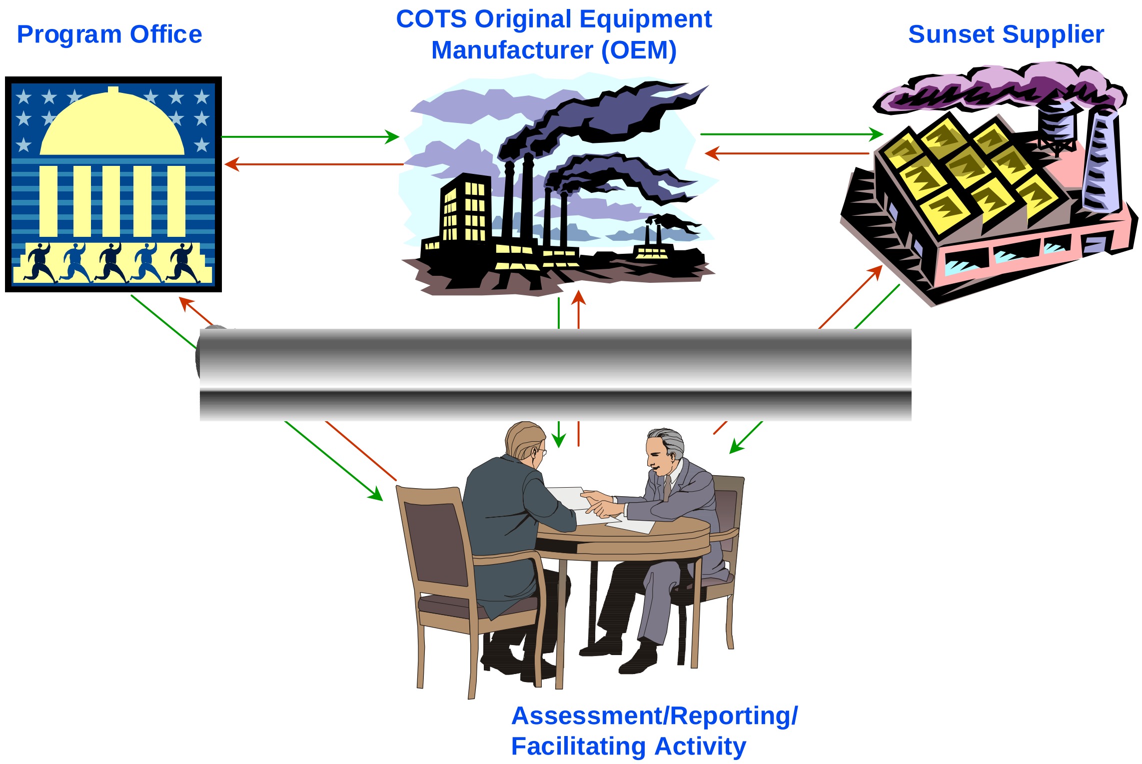
1. The Sunset Supply Base System

This Business Case Analysis (BCA) focuses on the Sunset Supply Base concept for supporting Navy hardware that incorporates the use of Commercial Off The Shelf (COTS) products. The Sunset Supply Base (SSB) concept is intended to extend the supportability of COTS products used in Navy weapon system programs. The concept is unique in that, it takes an After Market approach to supporting COTS due to Original Equipment Manufacturer (OEM) discontinuation of items presently or planned to be used in Navy weapon systems. OEMs routinely drop a product line or significantly modify a product as technology moves forward. Discontinuation or revision to a product is based solely on the business case for that product and when the business case can no longer support production the product is discontinued, regardless of the impact to the DoD/Navy (the DoD makes up only .4% of the market.[1) Glum, 2) Robinson, 4) Hartshorn]) Typically this occurs at approximately 18-months to 2-year intervals.[3) McDermott], As these COTS items become obsolete, the DoD/Navy weapon system baseline configuration becomes unstable during periods of time between scheduled technical refresh and insertion. This BCA will provide greater detail as to why this occurs but for the immediate discussion it would serve to briefly describe the circumstances surrounding this phenomenon.

The OEMs are market driven enterprises. They rely on high technology, high volume and their ability to get their products to market faster than their competitors. Typically, their product update cycles are less than 18 months. Their business objectives are centered on their existing and potential customer base. These attributes do not fit very well with Navy system support needs. The DoD has very unique applications and very low volume. Furthermore, the life cycles for these weapon systems are lengthy, easily exceeding 20-years, and because of the policy, procedures and guidance provided by DoD 5000, the Navy requires, and can only expect, minimum technology refresh or updates of not less than 5 years. [3) McDermott] The challenge for the DoD and the

Navy is to provide adequate operational readiness and maintainability support for the entire weapon system life cycle.

The SSB system offers a support infrastructure, which may include third party support to bridge the gap between industry business objectives and the Navy's requirement for long-term system support. The Sunset Supply Base concept advocates building partnerships between the OEMs and third party technical firms (Sunset Suppliers) via contractual relationships where appropriate. These Sunset Suppliers, although could quite possibly be the OEM, would typically be a small build-to-print assembly company that has the capability to manufacture the OEM's product. Certain agreements are expected on both sides(OEM and Sunset Supplier) that provide both benefit and security to their respective businesses. The OEM, who can no longer justify the business case to make certain items and must discontinue the product as a business decision, agrees to transfer the intellectual property and assemblage knowledge for a near-obsolete product to the Sunset Supplier. The Sunset Supplier agrees to manage this knowledge respectfully in continuing to produce these products. For this the OEM will receive royalties on the sale of all products produced while the Sunset Supplier benefits by gaining exposure and sales to the Navy. Perhaps the cornerstone to this arrangement is the Navy internal process that ensures supportability of these Sunset products by mitigating any component part obsolescence issues that may exist. The obsolescence reporting is accomplished by the Navy and is delivered to both the Program Management Office (PMO) as well as the OEM. Based on this information the PMO can now decide the most appropriate course of action to take in supporting their respective programs. Figure 1, The COTS Collaborative Environment, illustrates the SSB process. Presently, the Navy is guided through DoD 5000 and the Performance Based Logistics Initiative on how to maximize their investments for supporting present and developmental systems long-term.



Appendix C Figure 1: The COTS Collaborative Environment

The Sunset Supply Base system uses system engineering tools, methods, and processes to provide proactive activities that manage the obsolescence risk inherent to COTS use. The Sunset Supply Base concept is not intended to replace traditional support practices but rather work in conjunction with them to yield a robust infrastructure that provides the PMO with cost effective solution alternatives in the face of obsolescence. The net result is greater confidence in producing the lowest Life Cycle Costs (LLC) while meeting the Navy's supportability requirements. The key to the SSB implementation is to present to the OEMs an alternative business case that is favorable to their business requirements. The flexibility of the SSB system offers an opportunity for the OEM to gain additional revenue for nothing more than sharing the intellectual property rights to a third party SSB supplier that has the ability to manufacture and repair the OEM's product. In effect this arrangement accommodates the OEM business requirements.

As previously described, the SSB provides a mechanism for extending product availability beyond the OEM assigned date to discontinue as obsolete. At this point it is important to understand that the SSB is not advocating delivering obsolete technology to

the Navy's weapon and support systems, but given the constraints of DoD 5000, Acquisition Policies and Procedures, and the fact that weapon system development, at best, exceeds 5 years, the SSB system infuses stability into the system baseline configurations over a defined period of time. These periods, time scheduled between technical refresh and insertion, can be between 5 and 15 years depending on the programs expectations. Nevertheless, the SSB concept will ensure supportability during this period by establishing an arrangement where the DoD/Navy can leverage large businesses in their strong suit of technology, market leadership, and quantity in manufacturing, while at the same time take advantage of the capabilities of the small businesses in terms of their agility, small production run capabilities, and their desire for long-term partnerships.

Under an SSB environment, a triple-win situation arises for all parties. The Navy wins by getting the long-term supportability, maintainability, and operational readiness at reduced life-cycle costs. With this the PMO can in effect optimize their technology refresh cycles, upgrades or redesigns. Furthermore, they also can expose and manage obsolescence or shortage issues associated with piece parts used in COTS deployed throughout all participating Navy programs. This function or information and risk sharing, will not only benefit the Sunset Supplier in fulfilling their contractual obligations but will serve the Navy in a much broader sense by offering the derived obsolescence and shortage data to the Navy as a whole. In managing the obsolescence risk in this fashion the Navy avoids costly redesigns and the resulting perturbations to the logistic, maintenance, and other support functions.

The OEM benefits through compensation or royalties for each item procured by the Navy. In addition, they get to claim long-term life-cycle support for fielded COTS at lower costs and minimal impact to current and future weapon systems. All of this by simply transferring the intellectual property rights to the Sunset Supplier. Of course, the OEM could easily decide to perform the role of the Sunset Supplier themselves if they determine that the benefits derived are aligned with their business strategies.

The Sunset Supplier wins in terms of defining a new market; that is, new customers and new product lines. They also receive valuable obsolescence knowledge through sustainment engineering expertise from the SSB infrastructure. To this end, they

are able to develop long-term relationships with their user community (OEMs and the Navy), thereby increasing revenues, establishing security for their business, improving their position for future opportunities and gaining the ability to have long-term business planning.

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III. THE BUSINESS CASE

This document serves as a tool that supports the planning and decision-making with respect to implementing the Sunset Supply Base system. Of course, it could not be expected that the SSB system would be the solution for all Navy programs nor is it intended to replace traditional support practices, but as mentioned previously its true value is realized when its implementation is in conjunction with current processes. In fact, the acceptance of the SSB system only provides the PM with additional cost effective solution scenarios in terms of weapon system support, maintainability and operational readiness. Therefore, this document focuses on the SSB as a viable solution alternative for the Navy PMOs to consider in their decision-making efforts with respect to optimizing return-on-investment (ROI). The phrase return-on-investment is not necessarily used in the strict sense here, but rather alludes to the challenge of reducing life-cycle costs while maintaining adequate support levels and system baseline stability over predefined periods of time. However, since ROI is in effect a measure of a company's performance, it is appropriate in this case since the task of the PMOs is to get the "most bang for the buck" so to speak, which is in essence a measure of their performance. With that said, the analysis presented within this document will consider several financial metrics to be discussed in more detail later in this document. For now it is important to understand the value of this business case in the selection process of solution alternatives within a solution space. This business case analysis will detail the likely financial results and business consequences of implementing the SSB system so that the proposed benefits and risks are succinctly documented and understood.

This Business Case Analysis (BCA) looks at the implementation of the SSB system on the Ship Self-Defense System (SSDS) Mk1. It will consider the consequences of implementing the SSB infrastructure for providing COTS support for the SSDS program. These consequences, which will include both tangible and intangible results, will be analyzed for conformance to DoD policy, program requirements and overall cost/benefit. Furthermore, it will look at how well the actual implementation relates to the goals and objectives of the SSB. In short, this business case will examine the likely

costs and benefits that will result in implementing the SSB system for supporting the SSDS program. In considering SSB implementation this analysis will report on four scenarios:

- Traditional support practices.
- Full SSB implementation in which all COTS components are support via Sunset Supply Base infrastructure.
- Partial SSB, where only those COTS components are supported in which the OEM and Sunset Supplier have agreed to enter into a contractual relationship.
- Modified SSB implementation, where the use of the SSB system is only used where it makes sense. The SSDS Cots Working Group, which is responsible for overall execution and management of the SSB system for a particular program, makes these decisions.

IV. SUNSET SUPPLY BASE GOALS AND OBJECTIVES

In establishing specific goals and objectives, it is important to understand the DoD/Navy needs and expectations. In general, the DoD/Navy is focused on improving program supportability and extending the reparability of COTS for 5 years and beyond. Furthermore, they are looking for a mechanism that will align COTS update cycles with program technology refresh and insertion cycles. The SSB accomplishes this by providing valuable insight to potential obsolescence issues through available predictive toolsets. Additionally, the SSB will mitigate maintenance and supportability issues at the assembly level. Having this capability is only part of the solution though; success will depend on productive and effective partnering between government and private sector entities. Moreover, this partnering must be met with a willingness to develop long-term relationships. Therefore, one of the objectives of the DoD/Navy within the SSB environment is to encourage such teaming while ensuring desirable benefits for all participants while protecting individual interests (i.e. COTS OEMs' proprietary design rights). In developing these long-term relationships, the DoD/Navy must precisely identify the roles and responsibilities of all participants in the SSB process. A first step is to define the interfaces and establish how these interfaces will be managed to achieve efficiency and success. Continued success will depend on constant awareness and assessment as to why each entity chooses to participate and to provide incentives for continued involvement.

As described, the main objective of the SSB is to provide an alternative solution to the PMs for supporting COTS products over a predefined period of time at an affordable and even reduced cost to the program. There are also specific goals of implementing the SSB. These goals are listed below. In reviewing this list, keep in mind that the overarching objective is to be able to reach these goals while reducing Life Cycle Costs (LCC). In each case, achieving the respective goal becomes a valuable asset in itself and the investment needed to reach each goal must be appropriate for the value derived.

A. SSB SPECIFIC GOALS:

Achieve significant and quantifiable cost savings over the product life cycle.

The SSB process makes upfront cost assessments that will provide valuable knowledge needed for effective decision-making. Cost structures will be tracked and continually assessed over the product life cycle resulting in the capability of procuring products at the point of customer demand vice Life of Type Buys (LTB) at the assembly level based on traditional predictive models.

To be able to identify, quantify, and mitigate supportability risk to programs.

The SSB process must methodically and adequately derive the risks associated with obsolescence. These risks identified must be measurable in order to successfully mitigate them. Furthermore, the information and knowledge gained through this process must be accessible by all participants.

Extend the life cycle and supportability of COTS.

In defining the metrics for ensuring long-term COTS supportability, the SSB process must consider the war-fighter supportability requirements. The challenge is to meet expected military performance goals by continuing to leverage commercial technology developments while at the same time being able to offset the problem of diminishing material.

Provide infrastructure to support existing platform/combat systems in support of the PMO.

The SSB must focus on the PMO objectives for developing and sustaining weapon systems. To this end, the SSB must be capable of effectively identifying program risk and then mitigate these risks as they relate to COTS and life cycle management. Success will hinge on providing an infrastructure as early as possible in the development process in order to establish the supportability of COTS components.

A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).

The SSB process must be flexible. To this end, the characteristics of such a process must be definable and repeatable. In effect, the SSB process must provide an additional option to supporting fielded COTS hardware as well as an alternative solution to DMSMS/Obsolescence Management for the overall program. This utility must have minimal to no impact on system performance.

Institutionalize methods for proactive management of COTS including DMSMS issues.

The institutionalization of these methods will require the development of non-standard Integrated Logistic Support (ILS), contract strategies and implementation methodologies that will access the commercial support base. In doing this, the process must be sensitive to proprietary design rights and provide a forum for appropriate negotiations. The methods employed shall improve product supportability problem detection and provide sufficient time for appropriate decision-making processes to implement the recommendations of the analysis for alternatives and solutions. Overall it shall provide aid to the decision-maker by producing technology assessment and management guidance at various levels - piece parts, lowest replaceable units, units, subsystems and multiple platforms.

A system that leverages Navy and commercial supportability assets and provides a networked solution.

The key to achieving this goal is for the SSB process to effectively coordinate the existing governmental functions that currently perform DMSMS/Obsolescence Management. By taking advantage of the various agencies that provide such functions, the SSB process leverages this information or knowledge on behalf of the PMO as well as participating commercial supportability assets. Success will depend on a robust and effective communication scheme that is both maintainable and fully meshed across the SSB entities.

Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation.

The process must be transportable in terms of its applicability to various DoD entities and their contract strategies. The SSB process will attempt to identify and integrate common functions across DoD/Navy agencies that deal with integrated logistical support. To this end, a more focused effort towards COTS supportability is realized that should also provide greater flexibility in dealing with the commercial sector. This scenario should be capable of providing incentives for the commercial industry into develop long-term relationships with the DoD/Navy.

Forecast budget requirements in support of the programs/war fighter/consumer.

Key to meeting this goal is the level of confidence achieved in presenting the outputs from obsolescence assessments and supportability method trade-offs. This

confidence should be realized at the PMO level and provide them with predictive information that will empower them to make the most appropriate programmatic decisions.

Improve schedule flexibility and support options of system upgrades or new development initiatives.

Schedule flexibility refers to optimizing the provisioning timeframes. Optimization will be accomplished by providing alternative support options for system upgrades or new development efforts. These alternatives should be tailored for the warfighter and the support activities' needs. The benefits that the SSB will strive for are immediate supportability, elimination of government levels of inventory stock, expeditious and reliable delivery to the warfighter, and commercial warranty of components.

V. SUNSET SUPPLY BASE OBJECTIVES

The objectives of the SSB process provide the rational for deciding the applicability of the SSB infrastructure. By formally stating the overall objectives of this subject, we essentially establish a basis by which the analysis can assign values to specific benefits and ultimately guide this effort into making a reasonable conclusion statement and provide realistic recommendations. These objectives are categorized and discussed below.

B. FINANCIAL AND BUSINESS PERFORMANCE

The overall objective mandated by the current Department of Defense (DoD) Systems Acquisition Process (DoD 5000) is to improve performance, including quality, at lower costs. This process focuses on delivering advanced or at least current technology to the warfighter faster. Program Management Offices (PMO) are challenged to offer rapid acquisition of reliable and supportable technology while also reducing Total Ownership Costs and improved affordability. In meeting this challenge, we see a proliferation of interoperable systems using COTS products. Also, we see quite often the use of similar COTS across weapon systems that are separate and distinct and have no physical or logical dependence on each other. The use of COTS in itself brings a certain risk with regards to the ability to support them long-term due to Diminishing Manufacturing Sources, and Material Shortages (DMSMS) and obsolescence, and the fact that many different programs or weapon systems are using the same COTS products, only increases the risks and threats to system sustainability across these programs. Therefore, the SSB process attacks these two areas, risk and costs, by providing a potential architectural solution that specifically addresses the issue of obsolescence and DMSMS, thereby reducing both risk and costs to the program. In answering the mail on this, so to speak, the SSB process strives to compress the provisioning timeframes, by partnering with private industry and providing them with incentives (as previously mentioned) to assume some of the risk (i.e. immediate supportability and warranty) and costs (i.e. stockage, storage and issue of COTS spares and repair parts). Establishing

these characteristics will have positive impacts in terms of supportability, program planning, program risk and TOC.

C. STRATEGIC POSITION AND OWNERSHIP

Partnering with the private sector to take advantage of commercial technology advances as well as support and maintenance are firmly established mechanisms used by the DoD/Navy. The potential cost savings that the DoD determined would be possible by pooling the expertise and capabilities found in private industry brought about this situation. Partnering takes on many forms (i.e. teaming, procurement/sales, work-share arrangements); but the important point here is that they exist and are being utilized more and more by the PMOs.[5) OSD] Furthermore, the Program Manager (PM) as part of the acquisition strategy must establish a support strategy (PM Toolkit). In fact, this plan must "address life-cycle sustainment and continuous improvement of product affordability, … and supportability, while sustaining readiness." [6) OSD] To this end, the PM has at their disposal a set of tools used to help in the decision-making process for determining the most cost effective alternative for supporting the system. The SSB architecture is challenged to position itself within this toolset as a viable alternative. A strategy for positioning the SSB architecture within the supportability analysis repertoire would include establishment or improvement of strategic alliances. The SSB architecture has already been implemented on three Navy programs (Ship Self Defense System (SSDS) MKI, SSDS MKII, and Sonar Mine Detecting Set (AN/ASQ-20X)) The relationships developed between the participating commercial entities and the Navy agencies should lobby the DoD executive offices with sufficient detail as to the benefits of implementing the SSB architecture on the respective programs. Since the SSB architecture was built on existing expertise and functions within the Navy, the SSB process is in fact owned and therefore managed by the DoD/Navy. Additionally, the long-term relationships that will be realized through the SSB environment should further emphasis and influence the policy-making office within the DoD as to the potential gains not only in the performance of supportability and sustainability functions, but in maintaining key core government technologies as well.

D. OPERATIONS AND FUNCTIONS

The objective here is simple – to improve program supportability by extending COTS reparability for 5 years and beyond. Why 5 years? Typically, the development of military systems has been 10 to 15 years, and the DoD/Navy have experienced approximately 5 to 7 year efforts for technology refresh or insertion. The reason for this is primarily due to the inherent nature of DoD to take a purposely conservative and thoughtful approach to implementing change. The DoD have constructed very well-defined controls for managing the acquisition process, which have in effect created obstacles for keeping pace with commercial product development. This conservative approach has resulted in a disconnect between the life cycle of COTS products and the typical reaction time of the DoD/Navy to field new equipment. The life cycle for COTS products are approximately 18 months to as much as 5 years (although rare), whereas the DoD typically takes 2 to 3 years in planning and an additional 5 to 7 years for implementation. The problem of supporting these weapon systems is further compounded when these weapon systems are expected to perform over an extended life cycle – possibly greater than 15 years. Given this situation, the SSB process has identified as an objective to support the product development cycle and ultimately the system life cycle. For weapon systems that have deployed COTS, the SSB architecture offers an opportunity for supporting existing technologies. Success in these areas will fulfill the SSB architecture's commitment to improving operations and functions within the PMO since they are the ones who must manage the program over its lifetime.

E. PRODUCT AND SERVICES

In terms of product and service, the SSB architecture offers a truly unique and effective process for improving customer satisfaction. The customer in this case is the warfighter who use and maintain the system. The PMO must ensure that they deliver key enabling technologies that must also be supportable for fixed periods of time. The SSB architecture offers an additional alternative for the PMO to consider as part of their support strategy. Furthermore, the SSB process allows the PM to match the COTS update cycles with the program's technical roadmap or refresh effort. The product is essentially a set of well-defined tools that provide obsolescence indicators and reports as well as the ability to mitigate maintenance and supportability issues at the assembly level.

By establishing and managing this information, the PMO becomes empowered with the knowledge necessary to deliver an improved customer service. In the long run the system integrity is maintained, which has several implications in terms of Integrated Logistical Support (ILS) - i.e. training, manuals, configuration control…

F. IMAGE

This is an unusual area since we are not talking about the image of a specific entity like an agency or company. The objective here is to promote the idea of the SSB architecture as a viable, effective and valuable alternative based on costs and benefits. At first glance, it may appear to some that the SSB process is trying to hold onto older technology. Old, meaning technology associated with COTS products that have been discontinued. The fact of the matter is that the DoD/Navy has not been able to keep up with commercial product update cycles as earlier mentioned. In a perfect world, it would be great to be able to transfer commercial state-of-the-art technology to the warfighter the moment it was deemed ready or at least when it hit the market. But as described previously, the acquisition process institutionalized by the DoD offers too many obstacles to achieve this. Although Acquisition Reform has yielded great gains in streamlining the acquisition process, it is still purposely conservative, deliberate and methodical, which translates to slow when compared to the current commercial development cycles. So as the military acquisition community is pushed by DoD 5000 to use COTS products as the preferred alternative for use in its weapon systems, the obsolescence issues are slowly getting worse. Also, extending the service life of currently fielded systems has been the norm for many years. The B-52 platform is probably the most notable and perhaps worst case. It's been in service since 1955, and is not expected to be phased-out until 2040 (94+ years). The 1994 issue of *Army RD&A Bulletin* highlighted this fact by stating how many current military systems are generally on a 54-year replacement cycle while technology "…has a half-life from 2 to 10 years". [7) Augustine] Most systems don't have such a life expectancy, but 15 to 30 years is fairly common. And when you realize that the fast pace nature of the OEM often take their products off the market regardless of the impact to the Navy, its not hard to understand the need for a process that is designed to provide real solutions to this obsolescence issue. This is not news to the PMOs as they have been force to deal with DMSMS, which is why they routinely fund and support

DMSMS activities to meet the Navy's ever increasing need. The SSB system is designed to specifically address these risks, but more importantly, it is expected to work with existing support systems as an interfacing method to optimize solutions in managing the obsolescence risk on COTS products. Furthermore, not only does the SSB system offer significant supportability and cost benefits to the PMOs, it also strives to be recognized as a contributor in Navy/Industry cooperation, a major initiative underway particularly in the Navy. Getting this point across is one of the objectives of this business case. Therefore a case will be made based on both tangible and intangible benefits and the costs to achieve them, hopefully leading to a department wide adoption of the SSB concept. So promoting the image of the SSB is a challenging yet important objective for this business case.

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VI. BUSINESS NEEDS

A. BACKGROUND

Over the years the Department of Defense (DoD) has been plagued with development programs that have experienced significant cost overruns and schedules that have slid to the right all too often. In the end, the delivered weapon systems prove to be of little value due to the enormous delay of deploying them. The challenge to design, develop and implement processes to address these issues is an ongoing initiative. Making government more efficient has been a continuous theme for years now. In fact, as early as 1980 Congress passed the Paperwork Reduction Act in a step towards improving government performance. In 1993 the Government Performance and Results Act, which required government agencies to set strategic goals, measure performance, and reported on the degree to which goals were met.[8) GAO] More recently, in 1996, Congress passed the Information Technology Management and Reform Act (Clinger-Cohen Act). This act essentially required government agencies to improve the way they selected and managed Information Technology (IT) projects.[9) Clinger-Cohen] Soon after, the Office of Management and Budget (OMB) established circular A-130, Management of Federal Information Resources. The purpose of this circular was to further establish a policy for managing Federal Information Resources. [10) OMB] The result of the Clinger-Cohen Act and OMB Circular A-130 was the establishment of a comprehensive approach by individual federal agencies to improve the acquisition and management of their IT development efforts. Working within this new process, PMOs began aligning their resources in support of their respective strategic missions. To be effective they began to implement investment management strategies that established control mechanisms that would align the appropriation of funds to their strategic mission. In effect, they improved the way they selected, planned and managed their development programs by restructuring the way they allocated their resources before any initial investment was made in a particular program. One of the ways these agencies achieved this was rethinking the selection process. Traditionally, priorities were given to their programs and subsequent decisions on which programs would be funded were made based on this. Under this new way of thinking, the selection process was centered on a program’s cost, benefit and risk

assessments. These three elements would be quantified and analyzed prior to any release of funds. In essence, a Business Case Analysis was performed as part of the selection process.

In terms of the Sunset Supply Base concept, a Business Case Analysis (BCA) is presented in this document to reflect its benefits and importance to the DoD/Navy's mission. Therefore, this document includes information on scope, alternatives, costs, benefits, risk and acquisition strategy. An overview of the SSB process has already been given, as well as its goals and objectives. As part of this analysis we must align these with the DoD/Navy objectives for product support. At this point it is important to address these DoD/Navy objectives in broad terms as identified below.

B. BUSINESS CASE

In today's environment, PMs are guided to make program technical decisions based on the business objectives of their agency. In terms of product support solutions, system baseline assessments are made, which form the basis for conducting the business case analysis. The Deputy Under Secretary of Defense (Logistics) describes the business case as "…a tool used to manage business process improvement activities from inception through implementation. A business case is a document that identifies functional alternatives and presents economical and technical arguments for carrying out alternatives over the life cycle to achieve stated business objectives or imperatives." [11) DUSDL] Business Cases are created all the time for Performance Based Logistics (PBL) tasking. PBL is a NAVICP initiative that focuses on improving supportability as well as cost of ownership reduction efforts. We will cover PBL in more detail later on in this document, but for now it is important to understand that a Business Case Analysis is conducted for PBL in which alternative support solutions are assessed in terms of their ability to meet the logistics performance objectives of the warfighter. To this end, there are guidelines under DoD 5000 [12) DoD] for cost/benefit analysis used specifically for making business trade-offs decisions with regards to the most cost effective product support solution(s). So to recap, the Navy looks to the Business Case for making decisions on support strategies in an effort to provide the best supportability scenario at the most affordable level.

C. PRODUCT SUPPORT

Product support is a package of logistical support functions necessary to maintain the readiness and operational capability of a system. To achieve the appropriate level of readiness and operational capability of a system, a system must be designed to be reliable, maintainable, interoperable, and provide internal diagnostics and prognostics. But just as important is the logistical support functions which include supply chain integration, sustainment engineering, obsolescence management, distributed training, and a manageable integrated weapon system data environment. These functions all play an important role in supporting military capability. Military capability is defined by four major components: [13) DAU]

Force Structure – Refers to the capability of a military force based on its structure. A force structure must be robust, capable, equipped, trained, organized, and optimized in order to succeed on the battlefield. Product support is a crucial element to meeting the required level of capability.

Modernization – Refers to the task of a military force to modernize its forces and the weapon systems that they deploy. It is a key element to military superiority over present and future adversaries.

Readiness – Refers to the capability of a military force to accomplish the expected mission for which they were designed. Although military readiness is difficult to adequately quantify as a whole, the support component is not. Without proper support, weapon system sustainment and ultimately warfighter capability are severely compromised.

Sustainability – Refers to the capability of a military force to maintain the necessary level and duration of operations to achieve military objectives. Sustainability depends on ready forces, materiel, and consumables in enough quantities and working order to support military efforts.

With respect to each of these four components, product support plays a crucial role. In terms of force structure, by increasing system availability levels through

improved product support mechanisms we can also minimize the support requirements for military manpower. Reducing manpower requirements in the support area translates to a reallocation of these resources to core warfighting missions. With respect to modernization, support strategies that result in lower support costs means that these funds can be redirected to achieve the Navy's re-capitalization and modernization objectives. Readiness is improved when support strategies are designed and executed to meet military performance requirements. And finally, if the support strategy are designed and executed to accurately assess support requirements, then the weapon systems themselves become more sustainable. To optimize readiness and sustainability, a product support process must be capable of anticipating vulnerabilities in the supply chain and provide resources at the moment they are needed. In fact, per *NAVAIR's Contracting for Supportability Guide,* PMs are directed to a strategy that procures these items when they are required. [14) NAVAIR]

In the end, the Navy's objective for product support in a rather broad sense is to migrate to a product support strategy that is based on output measures such as availability of weapon system equipment. In fact, the Office of the Deputy Under Secretary of Defense for logistics and Material Readiness had chaired a joint service/defense agency team in preparing a comprehensive product support strategy, titled *Product Support for the 21st Century*, which advocates a more customer-focused product support environment. [15) DUSD] An environment that offers a "best value" approach to fulfilling warfighter demands.

D. LIFE-CYCLE MANAGEMENT

One of the main objectives of our military today is to continuously improve the operational effectiveness of its weapon systems resulting in a more capable warfighter. To this end, life-cycle support plays a critical role in ensuring that the warfighter's requirements are met throughout the life cycle of the weapon system. Since many of the Navy's weapon systems can expect life cycles that exceed 10 and even 20 years, the DoD as part of their *Joint Vision 2010* and *2020* have identified logistics as a crucial element for warfighter operational effectiveness. The weapon system support infrastructure must be capable of providing immediate support in a crisis situation. These product support strategies must be tailored in order to provide appropriate levels of readiness and

sustainment to all elements of the strategic and tactical operational forces.[16) DoD] By promoting a tailored product support environment, the warfighter will benefit in terms of responsiveness. A more tailored approach translates to more flexibility and ultimately greater effectiveness in life-cycle support. Needless to say, the acquisition community is constrained by very institutionalized policies and procedures; nevertheless, there are still opportunities for innovative and collaborative strategies that infuse flexibility into the support process. *Joint Vision 2010 and 2020* places more focus on logistics and challenge the acquisition community to expose these opportunities in meeting the demands of the warfighter. [17) DoD] This challenge is continuous and is focused on meeting the needs of evolving warfighter requirements. So to effectively meet the product support demands over the life cycle of the weapon system the PMO must also manage the warfighter's requirements as well. Part of this responsibility includes identification and insertion of technology. A planned approach for technology insertion must match warfighter requirements. Based on these requirements and the available technology, the Program Manager (PM) must decide on an appropriate technology refresh cycle. These tech refresh cycles should be determined around technology, warfighter requirements, and potential enhancements. They should not be based on material shortages or obsolescence. With that said, the PM should have at their disposal a set of product support alternatives to optimize this effort over the life cycle of the weapon system.

1. Cost

Per DoD 5000.1, Departments are expected to integrate the acquisition and logistics processes that are focused on Total Ownership Costs (TOC).[12) DoD] Furthermore, the directive identifies supportability as a key performance factor. In effect, the support strategy becomes a part of the Systems Engineering process. In this way, the PM can gain better control of the costs associated with supporting the weapon system. Cost has become an even greater concern in the DoD's current fiscal environment. The military is challenged to continue an aggressive modernization program in light of increased operations. Additionally, modernization efforts are further threatened due to expectations of near-term readiness levels of existing systems and reductions in infrastructure. The days of simply increasing the defense budget are gone. Given the

tempo of military operations over the years, it is easy to conclude that these operations take precedence over future modernization efforts. In fact, according to the Joint Aviation Logistics Board (JALB) June 1999 report on *Commercial Support of Aviation Systems*, since 1990 procurement activities have dropped by 53 percent where operations and maintenance efforts have decreased by only 15 percent. [18) McIlvaine] From this it is easy to see that replacement of existing systems are being delayed as well as a likely lengthening in the technology refresh cycles. In the May 1997 *Report of the Quadrennial Defense Review*, then Secretary of Defense William Cohen highlighted this fact by stating that we are facing a gradual aging of military force. [19) DoD] As a result of this environment, current political pressures have driven the PMOs to explore more economical alternatives to supporting warfighter requirements.

2. DoD Supportability Goals

As stated earlier, the Department of Defense Directive 5000 series directs the PMOs to focus on TOC as a key element of measure for acquisition performance while meeting warfighter requirements. The challenge is to meet warfighter demands, in terms of overall capability, at an affordable cost. Since there is an obvious cost delta from one support method to the next, we conclude that the support strategy directly impacts both warfighter capability and cost. Therefore, DoDD 5000.1 defines supportability as a key performance variable in the systems engineering process and it further emphasizes the importance of supportability in light of a continual evolving logistics state that is striving to support joint operational forces. In an effort to gain control over the impacts that supportability has on cost and warfighter capability, DoDD 5000 instructs the PMs to consider logistics as part of the design process leading to a support strategy that is applied throughout the weapon system life-cycle. The ultimate objective being the delivery of reliable weapon systems that can be cost-effectively supported. This demand for full-life-cycle support management pushes the PMs to plan for <u>initial procurement</u>, <u>re-procurement</u>, and <u>post-production</u> <u>support</u>. In planning to support existing as well as weapon systems under development, the following goals have been derived from the DoDD 5000 guidelines. [20) DoD]

1) Integrate supply chains to achieve cross-functional efficiencies and provide improved customer service through performance-based arrangements or contracts.

The PM should take advantage of the existing functions that exist within the DoD as well as the contractor base. Consideration given to these entities should lead to an integration of these elements through traditional contracting arrangements. In this way the PM can optimize the support process. By integrating the expertise from these cross-functional elements the PM can expect greater performance and improve customer service.

2) Segment support by system or subsystem and delineate agreements to meet specific customer needs.

In terms of meeting warfighter support requirements the PM should consider applying support methods specific to the needs of the system or subsystem. One method clearly should not be applied across the board. The PM should consider the various alternatives and perform analysis to determine the best approach in terms of meeting warfighter demands as well as cost. In determining specific support solutions for a system or subsystem, contractual agreements can then be put in place to effectively manage that particular system or subsystem.

3) Maintain relationship with warfighter to the extent that system readiness can be continually assessed and maintained.

In the face of evolving warfighter capabilities and subsequently new development efforts as well as service extension of existing weapon systems, the PM must strive to keep abreast of current and future support requirements. Success will depend on continual communication with the warfighter in addition to establishing effective support strategies.

4) Select best-value, long-term product support strategies.

In an effort to provide the best performance at an affordable cost, the PM must consider all available support options and attempt to coordinate these alternatives into a comprehensive strategy that exhibits "best-value" over predefined periods of time.

5) Measure support performance based on availability of mission capable systems, instead of on distinct elements such as parts, maintenance and data.

Support performance directly impacts mission capability. The support strategy should address the impact of support on mission capability. To this end, availability

requirements address the readiness of the system. Overall system availability is dependent on the distinct elements of parts, maintenance and data; but the specifics of these are not adequate for clear assessment of mission capability. That is, the mechanisms of the support alternatives are transparent to the overall objective of supporting the warfighter. The support options are considered based on <u>overall</u> effectiveness in meeting customer capability and cost expectations.

6) Improve product supportability, system reliability, maintainability, and supportability via continuous, dedicated investment in technology refreshment through adoption of performance specifications, commercial standards, non-developmental items, and commercial-off-the-shelf items where feasible, in both the initial acquisition design phase and in all subsequent modification and re-procurement actions.

This goal is aimed at providing the warfighter with the latest supportable technology in an effort to improve weapon system performance. This is perhaps the greatest challenge the PM faces. The misalignment of DoD acquisition technology refresh cycles and the commercial technology update cycles, as alluded to previously in this document, pushes the PM to be innovative in terms of supporting COTS/NDI systems. Ideally, the PM would like to redesign or refresh a system in order to provide greater capabilities to the warfighter rather than due to obsolescence or diminishing material. This situation must be dealt with for all phases of the system life cycle.

The overarching theme of DoDD 5000, with respect to supportability, is that product support is part of the Systems Engineering process. And a key component of this process is supportability analysis. Furthermore, this analysis is to be executed throughout the weapon system life cycle and not simply confined to post-deployment. The analysis should consider reliability, availability and maintainability (RAM). The RAM system requirements cover both product support and training aspects. These elements are derived from the warfighter readiness requirements and shall be documented in a well-planned support strategy. [21) DoD] The support strategy should be tailored to the specific weapon system and its unique characteristics in terms of COTS, NDI, and MIL-Spec mix as well as the feasibility of particular support alternatives. In the end, the ultimate goal is to provide the warfighter with the level of capability readiness they demand in the most cost-effective manner. And since supportability is a major

component in meeting this requirement, the supportability strategy should consider all supportability solution alternatives in an effort to deliver a “best-value” approach.

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VII. ALIGNMENT OF STRATEGIC BUSINESS OBJECTIVES AND GOALS

In this section we attempt to align the objectives and goals of the Sunset Supply Base (SSB) system with DoD objectives and goals. The purpose here is to see how the SSB system meets the needs and expectations of the Navy's acquisition process. Prior to any analysis it is important to ensure that the system under study is appropriately addressing the concerns or deficiencies found within the targeted environment. In this case we are looking at how the SSB objectives fits into the Navy acquisition process and what goals it can help fulfill. Since we cannot expect a one-for-one alignment, the approach here is to consider how each objective or goal of the SSB fulfills, in some part, the objectives and goals determined for the agency (DoD/Navy).

A. ALIGNMENT OF OBJECTIVES

1. Business Case

As discussed earlier the Navy looks to the Business Case for making decisions on support strategies in an effort to provide the best supportability scenario at the most affordable level. This document itself serves to fulfill this objective. A business case analysis of the SSB concept is to be performed to give the reader an understanding of the benefits offered and at what costs. Based on the outcome of this analysis, one of the objectives of this effort is to promote the idea of the SSB architecture as a viable, effective and valuable alternative based on costs and benefits. Therefore, keeping in line with the Navy's expectation of a business case approach to determining acceptance of an alternative, a case will be made for the SSB system based on both tangible and intangible benefits and the costs to achieve them, hopefully leading to a department wide adoption of the SSB concept.

2. Product Support

The Navy's objective for product support is to migrate to a product support strategy that is based on output measures such as availability of weapon system equipment, an environment that offers a "best value" approach to fulfilling warfighter demands. In essence, the Navy is looking for ways to improve performance.

Performance is defined by how well a support strategy meets warfighter supportability requirements and at what cost. Of course there is always a trade-off between performance and cost, and the Program Managers (PM) are given a set of tools to manage this performance/cost relationship. In terms of product support, the PMs have at their disposal a collection of alternatives to optimize their support strategy. As part of its Strategic Positioning objective, the SSB architecture is challenged to position itself within this toolset as a viable alternative. Furthermore the support strategy is to be applied throughout the weapon system life cycle; the ultimate objective being the delivery of reliable weapon systems that can be cost-effectively supported. This includes plans for initial procurement, re-procurement, and post-production support. Understanding these demands, the PM is challenged to deliver key enabling technologies that must be supportable for fixed periods of time. The SSB infrastructure is driven to provide this long-term supportability insurance. In fact, as part of its objective to positively impact Navy supportability functions, the SSB process is geared towards improving program supportability by extending COTS support during the initial procurement, re-procurement, and post-production phases. In the end, for weapon systems that have deployed COTS, the SSB architecture offers an opportunity for supporting these existing or key enabling technologies. In the end, both the Navy acquisition community and the SSB process are driven not only to optimize the performance of supportability and sustainability functions, but also in maintaining key technologies. So in terms of product support, the SSB objectives concur with the Navy's acquisition expectations with respect to supporting the products and weapon systems in the most proficient and cost effective manner.

3. Life-Cycle Management

DoDD 5000 emphasizes how life-cycle support plays a critical role in ensuring that the warfighter's requirements are met throughout the life cycle of the weapon system. As mentioned previously, the PM should have at their disposal a set of product support alternatives to optimize this effort over the life cycle of the weapon system. Again, the SSB infrastructure as part of its Strategic Positioning objective hopes to make a case for the DoD acquisition policy makers as to the benefits of including this process as part of the PMs toolset of supportability solution alternatives. In terms of enhancing

the operations and functions of DoD supportability process, the SSB process has identified as an objective to support the product development cycle and ultimately the system life cycle. In particular, the SSB process focuses on maintaining system baseline stability between technology refresh dates over the entire life of the weapon system. To this end, the SSB process was designed to have positive impacts in terms of supportability, program planning, and program risk, with the objective of influencing improvements in the life cycle management of the program.

4. Cost

The Program Management Offices (PMO) are guided by DoDD 5000 to explore more economical alternatives to supporting warfighter requirements with the overall objective of meeting warfighter demands, in terms of overall capability, at an affordable cost. Again, one of the objectives of the SSB concept is to offer an additional supportability solution alternative for improving performance in supporting the weapon system, including quality, at lower costs. So in architecting the SSB system, the intent was to not only have positive impacts to supportability, program planning, and program risk, but to also introduce significant reductions in Total Ownership Costs (TOC).

B. ALIGNMENT OF GOALS

The following table presents the alignment of SSB and Agency goals.

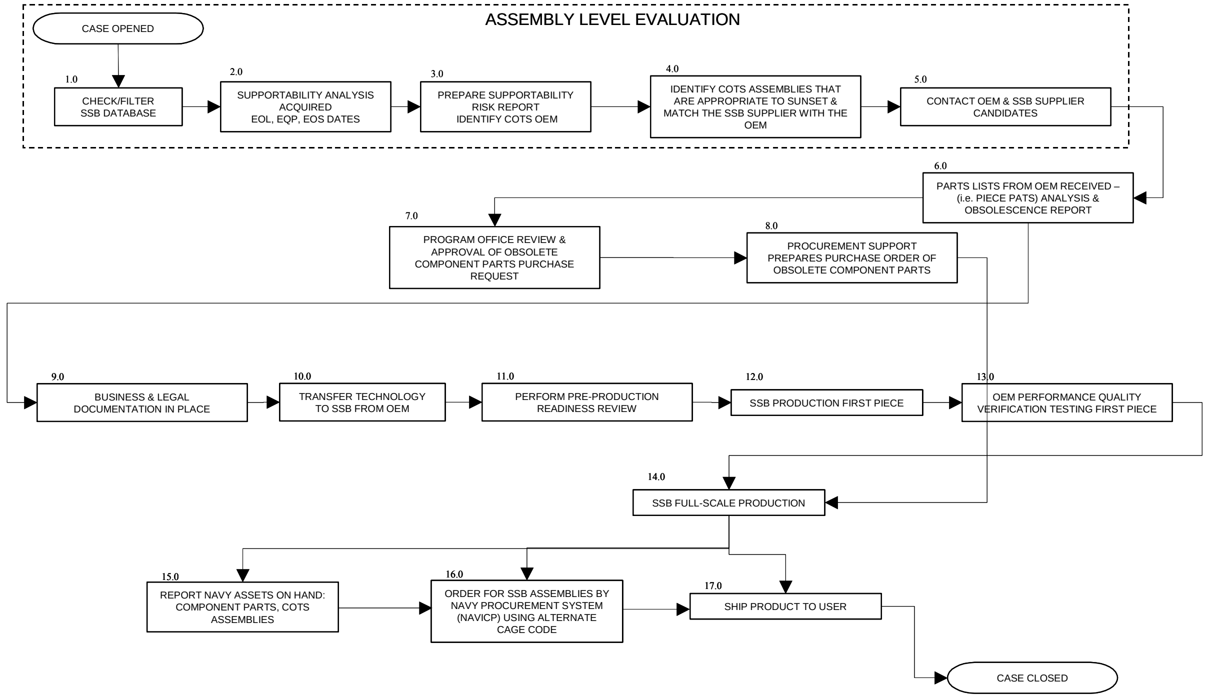
Agency Goal #	SSB Goal(s)
1. Integrate supply chains to achieve cross-functional efficiencies and provide improved customer service through performance-based arrangements or contracts	
7	A system that leverages Navy and commercial supportability assets and provides a networked solution.
8	Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation.
2. Segment support by system or subsystem and delineate agreements to meet specific customer needs.	
4	Provide infrastructure to support existing platform/combat systems in support of the PMO
5	A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).

Agency Goal #	SSB Goal(s)
3. Maintain relationship with warfighter to the extent that system readiness can be continually assessed and maintained.	
4	Provide infrastructure to support existing platform/combat systems in support of the PMO
5	A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).
4. Select best-value, long-term product support strategies.	
1	Achieve significant and quantifiable cost savings over the product life cycle
3	Extend the life cycle and supportability of COTS.
9	Forecast budget requirements in support of the programs/war fighter/consumer.
5. Measure support performance based on availability of mission capable systems, instead of on distinct elements such as parts, maintenance and data.	
5	A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).
6	Institutionalize methods for proactive management of COTS including DMSMS issues
6. Improve product supportability, system reliability, maintainability, and supportability via continuous, dedicated investment in technology refreshment through adoption of performance specifications, commercial standards, non-developmental items, and commercial-off-the-shelf items where feasible, in both the initial acquisition design phase and in all subsequent modification and re-procurement actions	
3	Extend the life cycle and supportability of COTS.
6	Institutionalize methods for proactive management of COTS including DMSMS issues
9	Forecast budget requirements in support of the programs/war fighter/consumer.
10	Improve schedule flexibility and support options of system upgrades or new development initiatives

Appendix C Table 1: Agency and SSB Goal Alignment

VIII. SSB PURPOSE

By defining and aligning the SSB objectives and goal with the objectives and goals of the DoD/Navy, PMOs we can better focus on the most critical aspects of the SSB process and formulate a general purpose for its implementation. Based on this alignment we conclude that the overall purpose of the SSB architecture is to provide dependable, cost effective supportability insurance for COTS based weapon and support systems. The SSB process focuses on obsolescence issues and material shortages associated with COTS usage in military weapon and support systems. Addressing these specific areas, the SSB provides an opportunity to extend COTS supportability in an effort to stabilize the weapon system baseline. Success is driven by the effectiveness of the SSB process to assess and manage COTS technology obsolescence. The key to achieving this lies with the ability of the SSB process to effectively address these issues via technology obsolescence forecasting methodologies. In effect, the SSB architecture provides a process for managing changes to COTS based systems. Figure 2 illustrates the 17-Step Implementation Process and when combined with other supportive SSB infrastructure tools, methods and processes, provides a continuous review/mitigation of DMSMS issues. Ultimately, the SSB architecture exists to respond to the demands of the warfighter. The warfighter requirements are communicated to the PMO, and the PMO is tasked to develop and support systems that provide the expected combat power. As part of the Systems Engineering process the PMs develop a support strategy that accommodates the warfighter requirements. The SSB architecture offers a support alternative that when implemented as part of the support strategy, adds speed and agility into the supportability process, ultimately providing value as perceived by the warfighter.



Appendix C Figure 2: 17 Step Implementation Process

IX. GENERAL APPROACH

In this Business Case Analysis (BCA) we will address various supportability scenarios in terms of overall support costs. This cost is comprised of procurement costs and the resource dollars needed to implement the respective scenario. Cost data will be considered over a ten-year support period for the Ship Self-Defense System (SSDS). Each scenario will be evaluated in terms of overall cost, benefit and risk. We will then focus on the SSB implementation and how it compares to the other scenarios as well as how well it fulfills the objectives and goals stated within this document. In terms of evaluation criteria, we will look at funding profiles, initial investments, program flexibility and risk. The actual costs will be weighed against the benefits and evaluated for consistency to overall DoD guidance. This process will establish clearly defined financial and non-financial benefits of the SSB implementation. These benefits will be matched to specific SSB process goals. The goals will then be used to discuss the contributions to the SSB objectives.

A. INTRODUCTION: SITUATION AND MOTIVATION

1. Background

In this section we will identify the situation and motivation factors that lead to the formulation of the SSB concept. With the subject and purpose clearly defined, it is important at this point to understand the context of this BCA. This section will explore the realities associated with the DoD/Navy acquisition process in terms of supportability. By understanding the full context of this environment, this BCA can then articulate the results and recommendations with respect to the main points presented in this section.

2. Program Management

Per the guidelines set forth in DoDD 5000, the Program Manager (PM) is challenged to develop a support plan that takes advantage of the most effective methods in supportability while meeting specific military and statutory requirements. In this way, the PMs can optimize both performance as well as life cycle cost. The PM has the flexibility and authority to choose from a set of solution alternatives (to be covered later in this document). Additionally, the PM has the opportunity to choose between Organic,

internal Navy resources, or commercial sources of supply. The important thing to understand is that the PM has reasonable flexibility in the effort to optimize warfighter support. The primary objective is to achieve maximum weapon system availability at the lowest Total Ownership Cost (TOC). One initiative to achieve these objectives is the DoD COTS initiative. The general inclination is that in both the private and public sectors, COTS has been able to reduce costs while delivering the latest technology. Unfortunately, the use of COTS products does not come without its share of problems (to be discussed in greater detail later in this document). Nevertheless, the PMs are pushed to consider COTS products. The primary emphasis behind the push for the COTS initiative is the speed at which the market forces can deliver the latest technology. Subsequently, many Request for Proposals (RFPs) issued by the Program Management Offices (PMO) demand a certain level of COTS usage in the system. [17) Carney-Oberndorf] This expectation is echoed by DoD policy makers who have instituted policies for using COTS products as much as possible. Needless to say, the proliferation of COTS products in military systems has increased over the years. This increase has also lead to an increase in the number of required product upgrades and technical refreshes within a system. Some of the problems that the PMOs have had to manage include obsolescence, meeting new performance requirements, and implementation of more cost effective support strategies. Typically, these problems are met with engineering changes that tend to be costly. In reality, what is needed is a more phased technology management approach. An approach which provides three main elements:

- The ability to assess the technical and supportability status of current equipment. This includes equipment selected in the design phase as well.
- The ability to recognize potential supportability problems and recommend support solution alternatives.
- The ability to determine the costs of implementing these support-solutions over a specific period of time.

This process of technology assessment should play a critical part of the overall life cycle management of military weapon systems. The information and knowledge derived from this process will ultimately improve system integration, product replacement, upgrades, and technology insertions of weapon systems that are comprised of both military build-to-print equipment and COTS products. Given the variability of

Mil-Spec and COTS product usage, the PM has options as to source of support, organic or commercial. Armed with the knowledge derived from the technology assessment process, the PM can make better decisions on source of support selection that effectively optimizes supportability performance and Life Cycle Costs (LCC). In this way, the PMs' actions are consistent with military and statutory requirements for using the most effective means available for providing maximum weapon system availability at the lowest TOC.

3. Production / Sustaining Support

With regards to supporting COTS products, two concepts are important to understand that have motivated the inception of the SSB concept. They are Sustainment Engineering and producibility.

Sustainment Engineering – This refers to the ability of sustaining a system for its entire life. Currently sustainment engineering focuses on design for test and reliability, and the ability to repair in order to meet availability requirements. With the onset of COTS products in military weapon systems, the task of exercising these functions becomes difficult. Typically, addressing supportability issues associated with COTS products takes on a reactive stance. Re-designs are initiated reactively upon receipt of obsolescence or the End of Life (EOL), End of Production (EOP) notice. That is, little is done in terms of re-design until the COTS product has been officially labeled obsolete. Therefore, traditional sustainment engineering efforts have become incredibly difficult to perform without some insight into future technology trends. The DoD Acquisition Deskbook provides the Flexibile Sustainment Guide, which provides guidance to PMs for "…translating mission needs into stable, affordable and well-managed acquisition programs…"[23) DoD] The guide strongly urges the use of an open architecture approach to designing future weapon systems. The idea being, that future upgrades could be easily and cost effectively implemented if adherence to performance-based standards are maintained. The approach is a tremendous leap in managing DoD programs and its complete fruition should be realized years from now. But many current efforts are still struggling with implementing open-system architectures due to the unique requirements of the military. Suffice it to say COTS products have provided some benefit in terms of delivering technology affordably, but the supportability issues that come with trying to

sustain a COTS-based system, between periods of technology refresh, have not been completely solved.

Producibility – In the traditional sense, producibility is a measure of the relative ease of manufacturing a product. Typically, this means how easy is the item produced from a technical standpoint. In terms of sustainment, we use producibility to refer to a company's commitment and capability in manufacturing a product in an acceptable quantity with an expected high degree of quality and reliability. In looking at major weapon systems, one can only imagine the diversity of MIL-Spec and COTS products used within a particular system. From the PMs' perspective, support budget appropriations and control is profoundly complicated. Additionally, support engineering management is difficult as well, when one considers the likeliness that a program in the design phase will be supported from several different sources. To further complicate the situation, the various sources of supply are autonomous groups. This situation usually leads to poor communication between the sources of supply and DoD/Navy on support issues. The PM must rely on engineering support activities to pull the issues of support and producibility together in order to accurately assess program direction. This function is important given the interdependence of items in a system. In general terms, if a change is made to one item, due to upgrade or obsolescence, the PM needs to understand the impact this will have to other MIL-Spec or COTS items. The problem grows when we consider the chance that impacted items may not be easily producible. So we see that producibility is important because we have to make sure that whatever changes take place, we fully understand the impacts, and that we can maintain producibility of the system. Presently, producibility efforts remain largely unorganized. Given this situation a supportability assessment mechanism is needed in order to help PMs stabilize their system baselines. The critical information derived from such assessment will provide cost and schedule impact, and availability of critical material and equipment. The present situation is one of minimal producibility engineering activities. Typically, support issues are managed by the respective engineering or support organization. In effect what occurs is that the burden to ensure the system is producible or supportable is on the In-service Engineering Agent (ISEA) for that system. A daunting task to say the least, given the necessity for numerous Engineering Change Proposals (ECP) associated with

obsolescence. One should realize that ECPs lead to re-designs, which typically translates to increased costs and delays in schedule. This environment is a driving element for conceptualizing a process that can mitigate the risk of having to re-design for reasons of obsolescence. In the end, some attention must be given to maintaining production of certain key products for the duration between scheduled technology refresh dates.

4. Interoperability and Configuration Control

Interoperability through open systems architecture is not something that has come to full fruition with respect to military weapon system implementation. Military systems typically have very unique or stringent requirements that only very specific products can fulfill. To add to this, the systems or subsystems are so sensitive to change that an open-systems architecture is presently difficult to implement. If every system and subsystem could be redesigned using an open-systems approach, true interoperability could perhaps be achieved. Unfortunately, this is not the case. In fact, open-system architectures, although established as a goal for many DoD programs, will experience an extremely slow transition primarily due to funding. In the mean time, fielded systems as well as those presently under development that are using COTS products must be assured of supporting these items leading to a stabilized system baseline between periods of update or technology refresh. The importance of this cannot be understated, given the certification requirements that every system must meet before it is put into operation. The hope of true interoperability is a lofty goal, considering how tightly software and hardware are grown dependent over the years. Given this situation, it is not hard to see how a simple hardware change could easily require changes to system software code. COTS hardware changes regardless of impact to military applications. Remember, COTS product changes are driven by the market in which the DoD only maintains approximately a 0.4% market share. Additionally, the proliferation of COTS throughout military weapon and support systems results in a lack of control over the configuration of these products. By not possessing the design or having access to a design disclosure, the PMOs cannot provide insurance to the warfighter that the present system design will be stabilized or can effectively be supported for some pre-determined period of time. Without this control, the PM will unlikely be aware of changes in manufacturers' product specifications. For commercial customers it may be adequate to simply define the inputs

and outputs in product specifications. However, military applications have been built around closely coupled software -- minor changes to a piece of hardware using embedded firmware could conceivably result in thousands of hours of software engineering, testing and re-certification. This further emphasizes the need for control over the configuration management of COTS products. The present situation, in terms of interoperability and configuration control, assumes or depends on the openness or robustness of these systems to handle potential changes to COTS products. Nevertheless, the sensitivity of presently fielded weapon systems to minor changes illustrates the importance of stable COTS product configurations for effective support of these military systems.

5. Performance Based Logistics

Performance Based Logistics (PBL) is an initiative undertaken by the Naval Inventory Control Point (NAVICP) in an effort to improve support as well as infrastructure and TOC for Navy weapon and support systems. The focus is on improving customer support and total LCC management where customer input initiates a network of sources for delivering “best value” products and services. The primary objective is to improve the availability and reliability of products that are provided to the warfighter.

Concept – Contracts are awarded to specific suppliers that are then responsible for delivering products directly to the warfighter. All material is managed and stored by the supplier with little government intervention. This situation reduces the associated costs to the government. Each contract is unique depending on products and services that are required by the DoD and offered by the supplier. The contracts are for specific periods of time in which the product and services are needed. Each potential arrangement is evaluated through a BCA in order to determine the full value of the PBL contract. Each case is considered for its cost reduction and/or cost avoidance measures. The basis of PBL is in establishing logistics performance requirements and contractual incentives to mitigate obsolescence and lower the LCC.

Process – PBL proposes that all logistical support be incorporated into a performance-based business environment. An environment where commercial and Organic (government) capabilities are assessed and compared to specific logistical

requirements of the Navy for determining "best value". The PBL concept incorporates direct vendor delivery, technology insertion, reliability-centered maintenance, process improvement, business reengineering, public/private partnering and teaming. The PBL concept is applied to both fielded weapon systems as well as new acquisitions. In this process a single supplier provides all of the required products and services to the warfighter. All material management, storage, and handling is accomplished by this one supplier with little or no government intervention. These contractual arrangements promise to improve availability at lower TOC. To what degree, depends again on the preferred arrangement. Figure 3 offers typical PBL arrangements. [24) NAVICP]

Typical PBL Arrangements

PBL-Mini-Stock Point (PBL-MSP). Navy owns the inventory…contractor receives, stores, issues, and may also repair, the material… "MSP-Plus" includes a negotiated level of requirements determination (MIN/MAX).

PBL-Organic (PBL-O). An arrangement with an organic activity (normally via MOA) to procure, repair, stock and issue material.

PBL-Commercial (PBL-C). An arrangement where a contractor supplies commercial items. Customer requisitions are automatically routed through ITIMP directly to the contractor as a delivery order.

PBL-Partnership (PBL-P). An arrangement between a contractor and Navy such that the Navy performs a portion of support required by and for the contractor. For example, the contractor may sub-contract the Navy to perform maintenance support at an organic depot. This can be highly beneficial when addressing Core maintenance issues, in that the Navy is able to retain Core capability while acting as a "sub" to the contractor.

"Full" PBL. A contractual arrangement where the contractor manages (and may also own) the inventory, determines stockage levels, typically repairs NRFI material, and is required to meet specific performance metrics. Requisitions still flow through ICP, and ICP pays the contractor for performance but bills customers traditionally. Reliability improvements, technology insertion and reduced obsolescence may be some of the inherent benefits of a Full PBL. The contractor usually is given Class II ECP authority

and in some cases may also have configuration control. Additionally, Logistics Engineering Change Proposal (LECP) arrangements will be considered a subset of this category if they contain supply support clauses that fall under the definition noted above.

Total Logistics Support. A most robust form of PBL (typically referred to as Contractor Logistics Support (CLS)), where the contractor manages most or all facets of logistic support (i.e. ILS elements), including inventory levels, maintenance philosophy, training manuals, PHS&T, full configuration control, support equipment, etc.

Appendix C Figure 3: Typical PBL Arrangements

Characteristics – As mentioned in the previous paragraph, the contractor, through a PBL arrangement, performs selected government functions such as supply support, repair, sparing, obsolescence management, etc. In effect, the supplier has assumed some of the risks traditionally borne entirely by the DoD. Under the PBL process the contractor guarantees improved availability and reliability. Contractors are given more flexibility and control in configuration management. In the end, life cycle costs are expected to be reduced by initiating fixed price contracts that have incentives for the contractor to show cost savings while improving reliability and availability. Fixed price contracting is arranged to support a forecasted demand over a specific period of time, usually five years. During this period, the contractor is primarily accountable for performance. This assumption of risk on the part of the contractor means a "letting go" of some control by the DoD.

6. Sunset Supply Concept

Presently, the Sunset Supply Base concept is being implemented on three programs:

- Ship-Self Defense System Mk1 (NAVSEA)
- Ship-Self Defense System Mk 2 (NAVSEA)
- AN/AQS-20X Sonar Mine Detecting Set (NAVSEA)

The PMs for each of these programs have entered into this collaborative environment for ensuring long-term product support and the potential cost savings that this process offers. This process requires involvement between government (PMOs and

Navy field activities) and industry (DoD system integrators, COTS OEM vendors, and - where applicable – Sunset Suppliers). The broad objective of this process is a proactive planning and coordination effort that is focused on extending the life of high quality, complex COTS products. This is achieved by essentially extending the capability to build the product for defined periods of time. The net result is a reduction in cost in terms of system sustainment. The key to success is the proactive planning that goes into establishing reasonable product support timelines rather than reacting to changes to the COTS product. By implementing the SSB infrastructure, the PMs are seeking the following:

- Supportability of products defined by customer need, (5, 10, 15, 20 years)
- Life cycle cost savings, due to no lifetime buy at the assembly level. The assemblies are procured, as the customer requires them.
- Reparability of assemblies over the designated life cycle (5, 10, 15, 20 years)
- Hardware/Software/Firmware stability between technology refresh dates.
- Significant reduction in program risk as related to COTS and life cycle management
- Improved schedule flexibility and support options that can be tailored around warfighter requirements.
- Minimal or no impact on system operational performance. Since the product will continue to be supported in its original form, fit, and function, there should be no impact to performance. These products will continue to be produced by the Sunset Supplier.

The infrastructure for the SSB process is well thought out and structured in such a way as to allow for growth capability. A *Systems Engineering Development and Implementation (SEDI) Plan* for the SSB infrastructure has been developed to put into perspective the processes, methods and tool needed to implement the Sunset Supply Base (SSB) system. The resulting infrastructure is designed to fulfill the objectives and goals previously described. The essence of the process is to provide the interface management for long-term COTS supportability. In doing so, long-term relationships are established in an environment that preserves and protects the intellectual property rights of the OEM and business objectives of the Sunset Supplier. The infrastructure presented in the SEDI plan is composed of two functional areas; (1) programmatic support, and (2) infrastructure support. A brief outline of the functions and tasks taken from the SEDI

plan is provided in Figures 4 and 5. Implementation of the SSB infrastructure essentially establishes and empowers a support team that strives to meet the goals and objectives previously stated. Based on these goals, the team is responsible for ensuring expandability, transportability, reusability, leveraging capability, configuration management and control, affordability and LCC assessments. Important to understand is that these functions are embedded within the SSB process and are not duplicated anywhere within the infrastructure.

Programmatic Support
Programmatic Functions: 1. Interface with the PMO & Infrastructure Team 1.1. Details pertaining to specific program characteristics – 1.1.1. Number of systems 1.1.2. Number of COTS assemblies used and where 1.1.3. Insight into the prime contractors assembly call out 1.1.4. Reliability numbers (i.e. failure rates, MTBF, etc.) 1.1.5. Fielded systems concept of deployment and operation 2. Provide Recommendations 2.1. Buy quantities 2.2. Technology refresh intervals and interim support strategies. **Programmatic Tasks:** 3. Obsolescence reporting 4. Provide purchase recommendations 5. Interface with OEM, SSB supplier and PMO support teams 6. Involvement in applicable program activities 7. Identify and implement program specific flow-down requirements 8. Address quality issues (hardware/software, documentation, etc.) and interface with the OEM, SSB supplier, PMO, prime contractor, etc. 9. Cost assessment based on LCC and the unique opportunity to impact these costs through implementation of the SSB system.

Appendix C Figure 4: Programmatic Support

Infrastructure Support
Infrastructure Functions: 10. Interface with the programmatic POCs 11. Establish and maintain the OEM/SSB supplier relationships 12. Develop a database with appropriate controls and access rights 12.1. Creation of the database structure 12.2. Define methods for updating data and controlling access rights 12.3. Provide mechanisms for continuous maintenance 13. Provide a central site to enable open and private communication (i.e. specific server location, web site, bulletin board, etc.) 14. Perform analysis on the data gathered 15. Coordinate with all support activities where applicable (ISEA, TDA, etc.) 16. Report findings or status 17. Coordinate with other programs that could be affected by the reporting results 18. Perform on-site reviews at the SSB suppliers to assure schedule, cost and quality performance is maintained.
Infrastructure Tasks: 19. Database Management 19.1. Program generated, prioritized, Costs lists, at the assembly level 19.2. OEM provided, component piece parts lists and drawings detailing the make-up of the assembly level: Cautionary Note – These parts lists and drawings supplied through the OEM are obtained through entering a Non-Disclosure Agreement (NDA) and therefore necessitates special handling along with restricted access. 19.3. Development of a relational database; Design, Management, and Maintenance 19.4. Informational query and data extraction 20. Obsolescence Risk Management 20.1. Receive COTS assemblies list from programmatic POC 20.2. Perform assembly level obsolescence health/risk at that level 20.3. Retrieve from the COTS OEMs the component piece parts list for each assembly. 20.4. Filter the component piece parts list and condense list to active components for which predictive obsolescence tool are readily available and used as industry standards. Exceptions to this filtering process are handled on a case-by-case basis. 20.5. Perform a piece part level obsolescence health/risk analysis at the component piece part level. 20.6. Prepare an Obsolescence Risk Report for the program in an agreed upon format, by working with the programmatic POC 20.7. Perform continuous monitoring of the component piece parts by reviewing impact of ongoing obsolescence notices posted by the component piece part manufacturers. 21. Initiate the relationship with the Original Equipment Manufacturers (OEM) and

Infrastructure Support
act as the primary interface with them throughout the life of the SSB system. 22. Initiate the relationship with the SSB suppliers and act as the primary interface with them throughout the life of the SSB system and perform on-site reviews of SSB suppliers using an IEEE 1722 type evaluation. 23. Interface as required with other program support activities (i.e. ISEA, ILS, TDA, etc.) 24. Teaming with the programmatic POC and the other program support activities, define and document the expectations and required support from the infrastructure team. Typically these expectations and requirements are embedded in a Statement of Work (SOW), a tasking document, or in a Memorandum of Understanding (MOU) between the implementing activity and the PMO. Examples of these types of documents are available in Enclosure (9) – "Tasking Documentation". 25. As opportunities emerge, the infrastructure team is responsible for the interface with other activities such as other field activities, professional societies, government initiatives, industry working or focus groups, etc. that provide potential improvements or impacts to the SSB system and its implementation.

Appendix C Figure 5: Infrastructure Support

C. PROBLEM DESCRIPTION

This section will describe the problem of supporting COTS products within the context detailed in the previous section. A thorough understanding of the problem to which the SSB concept applies, will help in evaluating the overall effectiveness of implementing the SSB infrastructure.

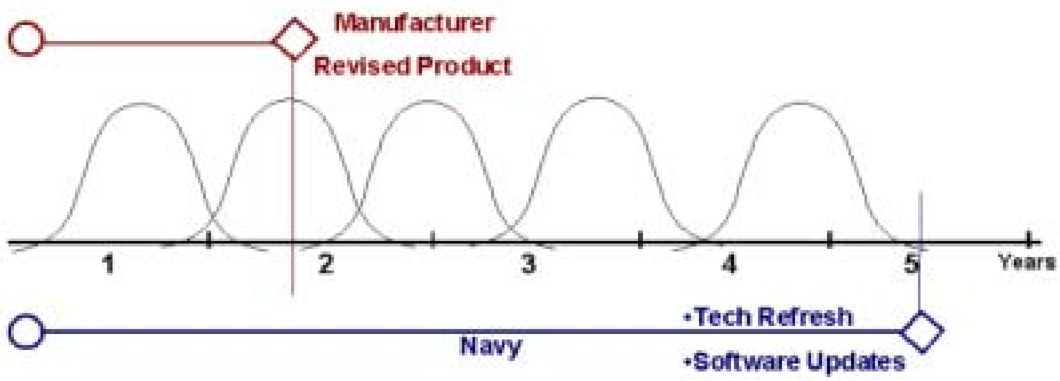
1. Economic Problem

The current DoD requirements include a scenario of increased operations while at the same time a continuous push for weapon system upgrades. The easy solution would be to increase the defense budget, although not very likely. Given the political pressures of today, DoD PMOs are challenged to search for more economical alternatives. The challenge, in effect, is to maintain near-term weapon system readiness while at the same time planning for weapon system modernization efforts. To add to this, the DoD is undergoing a serious reduction in government infrastructure. Given the current trend of increasing military operating tempos, the struggle to accomplish any sort of modernization effort is going to be difficult. In fact, financial resources are likely to be used to maintain these levels of operations rather than conducting serious modernization efforts. The Joint Aviation Logistics Board (JALB) June 1999 report on *Commercial*

Support of Aviation Systems states that "…discretionary procurement accounts dropped by 53 percent since 1990, while operations and maintenance activity declined by only 15 percent". [25) JALB] The implication of this statement is that replacement or upgrades to existing systems are effectively being delayed. [26) JACG] Secretary of Defense William Cohen, in the May 1997 *Report of the Quadrennial Defense Revie*w, observed that "Today, the Department is witnessing a gradual aging of the force." [19) DoD] This lends credence to the statement in a 1994 issue of *Army RD&A Bulletin*: "In actuality, our military hardware is now on a replacement cycle of about 54 years - this in a world where technology typically has a half-life from 2 to 10 years." [7) Augustine] The end result is that existing systems will have to be maintained at the required levels of availability and reliability for extended periods of time. Therefore, traditional support strategies will have to be re-evaluated to address this phenomenon. These traditional strategies typically expect total government ownership of support material and total government control over design changes. What this has leaded to is known as the COTS initiative. The emphasis on COTS product usage was brought on by the fact that the DoD could conceivably take advantage of technology developments in the commercial sector at a reduced cost to development programs. So given the fact that more and more of the defense budget is going to sustainment of operations, the financial resources needed to modernize existing weapon systems is decreasing. So to reiterate, more economical solutions to supporting these systems is needed and one initiative is the growing use of COTS products throughout DoD weapon and support systems. With COTS products come additional challenges in support, given the fast paced technology update cycles in the commercial sector as compared to the slow and methodical DoD acquisition process. Thus, there is an anticipated increase in material or product obsolescence. So the savings realized by implementing an aggressive COTS initiative could be offset by obsolescence and the need to redesign. This is not to say that COTS products have not proved beneficial, on the contrary, but the overall process for incorporation and sustainment of COTS products continues to evolve and PMs continue to be confronted with certain challenges associated with this. Therefore, a solution alternative is needed to counteract the costs associated with the redesign of weapon and support systems due to obsolescence rather than performance.

2. Sustainment Problem

The COTS initiative was brought about by the fact that the commercial sector essentially drives technology change at an extremely fast pace and that the DoD could take advantage of this while reducing life cycle costs. The COTS initiative provided a potential path to infuse new technology into the military systems and at the same time avoid the developmental costs associated with grooming the new technology. The rate at which private industry can develop and deliver new technologies is orders of magnitudes faster than traditional DoD acquisitions. Take a look at computing power, which has appeared to double every eighteen months. The same phenomenon has occurred across the spectrum of technology at different rates. Market forces other than the DoD essentially drive this explosion of new capabilities. The DoD makes up approximately 0.4% of the market share [4) Hartshorn]; therefore; it's not hard to see how commercial product lines are driven by the private sector vice the DoD. There are two fundamental reasons for this fast pace. One is the ever-increasing demand for new capabilities primarily in the private domain. Second, the competitive drive to get technology to market first and gain the most lucrative share of the market. In either case, the DoD has little influence. Original Equipment Manufacturers (OEM) routinely stop production on items that can no longer be justified from a business perspective regardless of the impact to the DoD. The typical length of time a product can be considered available is approximately 18-24 months. That is to say, manufacturers are developing and releasing new capabilities every 18 months to 2 years. In contrast, DoD weapon system acquisitions typically take 10 to 15 years to develop and fully deploy. At a very minimum, the DoD can presently only hope to achieve technology-refresh cycles of 5 years, which is still not adequately aligned with commercial product updates. See Figure 6 for a pictorial representation of this phenomenon.



Appendix C Figure 6: Technology Refresh Timing

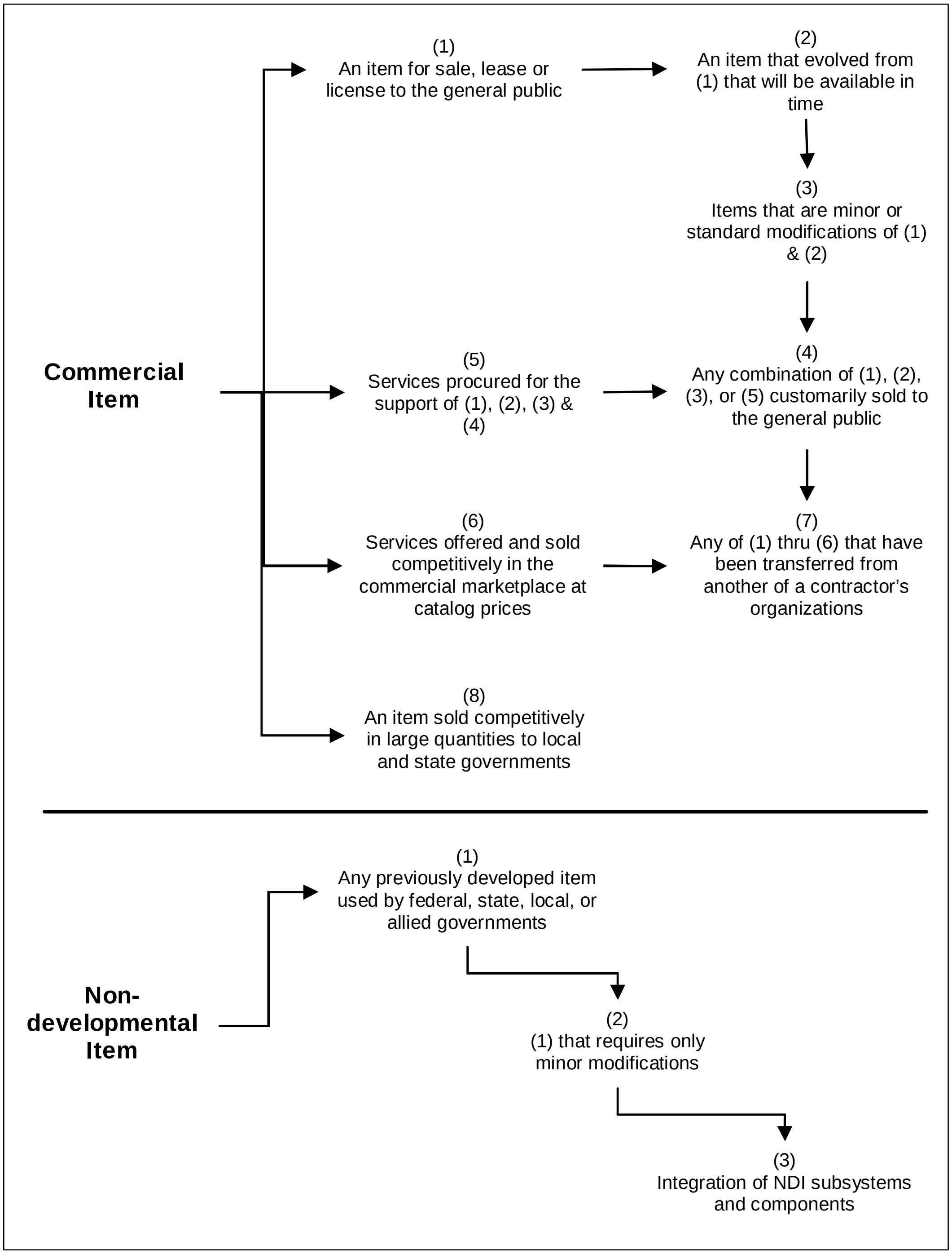
When we say fully deploy, we mean that even though a weapon system is ready to be installed, each platform for installation must be scheduled to receive it. Even if we consider an aggressive development effort within the Navy, the time to develop a new or enhanced capability could easily take 5 to 7 years. Once the weapon system has been tested and deemed ready for deployment, it will take additional 5 to 10 years to fully deploy. Every platform or ship that is to receive this weapon system must be scheduled and the work to install performed. Ship deployment schedules and the length of availabilities (in-port period when the work is performed) add serious delays to installing the weapon system. It is simply inconceivable to think that new technology, which is turning over every 18 months, can be infused consistently throughout the fleet. Of course, its possible to have different platforms upgraded to different levels of capability, but then we run the risk of incompatibility between platforms and a logistical nightmare in supporting various versions of the same weapon system. What this all comes down to, in terms of COTS, is a decrease in DoD control over weapon system design and subsequent support. The purpose here is not to discredit the COTS initiative as ineffective. The COTS initiative in conjunction with a well thought out open systems approach, will contribute greatly to DoD’s effort to bring the latest technology and capability to the warfighter at the most cost effective levels and be able to sustain such affordably. However, the COTS initiative has been ongoing for over 10 years and the DoD continues to struggle with COTS supportability. The initiative is deeply imbedded in policy, reviewing criteria and procurement methodologies for dealing with unforeseen

difficulties in implementing COTS. However, given the long development cycles and the time-consuming implementation efforts of military weapon systems, the DoD is finally realizing the "cause and effect" relationship between COTS products and perturbations evident in fielded systems. One only needs to visit the Defense Acquisition Deskbook (DAD) web site and search for documents that address COTS implementation. At the time of this writing, there were over 230 listings that addressed policy, planning, designing, fielding, costing, and supporting COTS. DoD 5000.2-R provides guidance lessons learned for PMs in dealing with COTS. The fact of the matter is that the DoD acquisition process is purposely constructed to take a conservative, thoughtful approach to implementing change, thereby introducing obstacles to the time elements necessary to keep pace with the commercial environment. The most important point to understand here is the disconnect between the life cycle of commercial products (1.5 to 5 years) and the typical reaction time of the DoD for modernizing fielded weapon systems. Remember from our discussion on Performance Based Logistics that system support is provided in whole via contracts of typically 5 years. During these 5 years the contractor or supplier is responsible for ensuring defined levels of system readiness and availability. During this period sustainment is continuously assessed. Upon notice of any obsolescence issues, the PMO has to decide on future plans for support or redesign. Traditionally, spares are bought and stored based on a forecasted need over this period of time. In reaction to the obsolescence announcement, the PMO enters a planning period of between 2 and 3 years. Following this is a 5 to 7 year expectation for actual implementation. So we are looking at approximately 7 to 10 years between system upgrades or replacement at a minimum. But now consider the fact that these systems are expected to be in service for 15 years or more and the supportability issues become apparent given the consistent 18-month to 2-year commercial technology life expectancy. (See Figure 3) In essence, when the DoD decides to use COTS products, they become obsolete during the planning phase. Even a well-planned approach can push COTS technology insertion into the implementation phase only to become obsolete during this period as well. This instability to systems' design baselines is a major issue for maintaining appropriate readiness and availability. Understanding the realities associated with implementing and supporting COTS products, an effort must be made to deal with

stabilizing the systems' design baselines so high performance in terms of support can be achieved

3. COTS Problem

The term COTS, Commercial-Off-The-Shelf, refers to the entire range of products and services procured by the DoD. Nearly every weapon system and their basic repair items use commercial items to varying degrees. Today, it is not a matter of all or nothing, but how much of the system is COTS based. Figure 7 is a notional interpretation of COTS as is defined in the Federal Acquisition Regulation (FAR) Subpart 2.1, Section 2.1.0.1 Definitions. [27) FAR]



Appendix C Figure 7: Notional depiction of FAR COTS/NDI Definition

The DoD mandate for COTS product use is driven by two important situations. First, the fact that the commercial market leads the DoD in latest technology development; therefore, in order for the DoD to access state-of-the-art technology they must come to the commercial sector. In the past the DoD lead the way in research,

development and application of technology for military weapon systems. Today private industry leads the DoD in these areas. Secondly, the present industrial base is very stable. That is in the face of obsolescence, DoD suppliers struggle to stay in business due to reduced procurement by the DoD. The larger companies have sufficient market share to remain stable through these periods of reduced DoD procurement. Additionally, they can respond to a surge in requirements by the DoD.

Given the widespread use of COTS products in military weapon and support systems, certain challenges are being faced in terms of ensuring long-term supportability. The challenges stem from serious obsolescence issues and material shortages. The challenge, in essence, is to provide life cycle support to fielded weapon systems that use COTS products. Consider for a moment that many systems will have life cycles that exceed 20 or 30 years, and one can easily imagine the sustainment nightmare involved. The slow acquisition process, the long life expectancies and traditional support methods are not consistent with commercial business practices. In fact, there is little incentive for COTS manufacturers to continue to produce items in rather small quantities just for the sake of ensuring some system performance baselines. If the DoD chose not to use COTS, there would be little impact to the commercial world. However, given the proliferation of COTS products throughout military weapon systems, when a product is no longer produced the impact to the DoD is profound and severe. Even small changes to a product can have serious repercussions to weapon system performance and design baselines. The fact of the matter is, there will be technology changes within the COTS arena and they will have direct impacts on military weapon systems, both fielded and under development. Slight changes in COTS hardware could possibly impact interfaces with other equipment or systems that may not be so obvious. Subtle specification changes to COTS hardware (i.e. timing, execution…) could have devastating ripple effects. Furthermore, changes to hardware could, and often do, require changes in software code in the larger system. A change in code translates into time and money. Time to make the necessary changes, test the changes, and deploy the changes and money to perform these tasks. This is not hard to understand, when you realize that many systems are built around software (architectures dictated by software). Software is a key enabler to achieving open systems architecture, as software is assumed easier to update than

hardware. Nevertheless, slight changes in software do have a cost associated with it and the impacts could be significant. In face of the rapid updates to software in the commercial domain, DoD re-integration efforts can be difficult and expensive. To this end, the continue implementation of COTS products in the development of military weapon systems will lead to a situation where these systems will constantly fall prey to technology that will not last and forever changing.

4. Conclusion

The use of COTS products in military weapon systems is a reality. DoD 5000.2 and the Federal Acquisition Regulations have both advocated the use of COTS products due to the potential benefits associated with leveraging big business capabilities. These capabilities include developing state-of-the-art technologies and delivering them in products that are produced in quantities that reduce cost. To this end, the COTS manufacturers' position in the marketplace, the company size and its technology edge impact the direction and update cycles of technology and the products that employ them. Therefore, COTS products hold a significant place in weapon system development and manufacturing because they can effectively facilitate the quick response to DoD changing needs. The net result to the DoD is a reduction in sustainment costs for COTS products as well as improved reliability and availability of the weapon system. However, since military weapon systems are typically unique, the use of COTS becomes a tricky business in terms of dictating system design and ultimately life cycle support. In terms of software, military applications tend to be very specific, and the weapon system cannot tolerate or support changes. Compatibility and configuration-control become crucial elements for both software and hardware. Support activities are pressured to maintain stabilized baselines in order to keep the certification of the system verifiable. These include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc…). Needless to say there are significant risks associated with COTS and therefore managing these risks is a crucial element for success. For weapon systems that do use COTS products some of the more identifiable risks are: [28) DoD]

- Engineering changes, increased costs, and potential schedule delays due to poor supportability late in the development or after fielding the system.

- Life Cycle Cost (LCC) estimates for COTS product usage is inaccurate due to poor logistical support analysis.
- Poor sustainability due to not considering supportability during the design phase.

Understanding these risks helps us to better define where the problem lies. With the problem description provided above, we can conclude that additional supportability solution alternatives are needed to address the shortcomings of the present COTS environment. A proactive position must be taken to include these alternatives in strategic supportability planning that will effectively mitigate the risks associated with COTS product usage in military weapon systems.

D. LIMITATIONS AND CONSTRAINTS

This section provides some further contextual information that limits or constrains the implementation of the Sunset Supply Base concept. Specifically, this section will address DoD policy, reviewing criteria, and methodologies that will be needed to evaluate the business case results. This section is not intended to provide detailed information on the specific topics; rather a general understanding is expected in order to realize how the benefits fit within the limits of governmental policy and regulation. Furthermore, each topic will be discussed in terms of COTS products, their deployment in military weapon systems, and their relation to supportability performance.

1. DoDD 5000

The major objective of DoDD 5000 [24) DoD] is to provide a model to the acquisition community for reducing cost and cycle times while delivering improved performance. The DoD 5000 process is a carefully constructed methodical approach for rapidly delivering demonstrated technology to the warfighter. This purposely, conservative approach is intended to optimize the acquisition cycle for time-phased requirements and evolutionary development. Essentially, the DoD acquisition style is moving closer to commercial practices. This movement advocates the use of COTS products for achieving rapid technology insertion and overall constraining life cycle costs. In fact, DoD 5000 recommends that cost should drive design, procurement and support. We mention DoDD 5000 here not as an attempt to educate the reader on the details of the directive, but to emphasis the boundaries to which the SSB infrastructure

must work within. Below are brief descriptions of DoD 5000 acquisition guidance and general expectation.

Overview – The Defense Acquisition system exists to ensure that the DoD's investments in technologies and product support is protected throughout the entire life cycle. An approach must be taken to make sure that demonstrated technologies could effectively make their way to systems that enhance warfighter capabilities. And additionally, that these systems can be supported to meet readiness and availability demands.

Policies and Principles – DoDD 5000.1 mandates several policies and principles for managing the Defense Acquisition process. In broad terms, these policies and principles cover the following are:

- Rapid and effective transitioning of science and technology to products that enhance warfighter capabilities.
- Rapid and effective transitioning through the various phases of the life cycle (Acquisition => Deployment/Fielding)
- Integrated and effective operational support throughout the entire life cycle. That is during development, installation and operation.
- Effective program management throughout the entire life cycle.

Operational Support – The PMOs are mandated to make any appropriate measures for integrating acquisition and support functions. To this end, they are expected to focus on TOC and supportability as a key element in the design phase of the acquisition cycle. Supportability is to be used as a performance indicator essential to the systems engineering process. DoDD 5000.1 essentially advocates a transformation in logistical support as a whole. Specific to operational support the PMOs are challenged to provide strategies that reduce logistical response cycle times and integrate DoD and commercial expertise all in an effort to provide the optimal customer service and system readiness levels. To realize the full benefit from these tasks, PMs are directed to focus on support issues as early as possible in the design process. The end result is the delivery of reliable systems that can be cost-effectively supported.

2. United States Code 10

USC Title 10 [29) USHR] provides regulatory elements for DoD behavior. Within Title 10 there are at least two statues that specifically address product support solutions that the DoD PMOs must comply with.

a. *Statue 2462*

(a) In General. - Except as otherwise provided by law, the Secretary of Defense shall procure each supply or service necessary for or beneficial to the accomplishment of the authorized functions of the Department of Defense (other than functions which the Secretary of Defense determines must be performed by military or Government personnel) from a source in the private sector if such a source can provide such supply or service to the Department at a cost that is lower (after including any cost differential required by law, Executive order, or regulation) than the cost at which the Department can provide the same supply or service. (b) Realistic and Fair Cost Comparisons. - For the purpose of determining whether to contract with a source in the private sector for the performance of a Department of Defense function on the basis of a comparison of the costs of procuring supplies or services from such a source with the costs of providing the same supplies or services by the Department of Defense, the Secretary of Defense shall ensure that all costs considered (including the costs of quality assurance, technical monitoring of the performance of such function, liability insurance, employee retirement and disability benefits, and all other overhead costs) are realistic and fair.

b. *Statute-2464*

(a) Necessity for Core Logistics Capabilities. - (1) It is essential for the national defense that the Department of Defense maintain a core logistics capability that is Government-owned and Government-operated (including Government personnel and Government-owned and Government-operated equipment and facilities) to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements. (2) The Secretary of Defense shall identify the core logistics capabilities described in paragraph (1) and the workload required to maintain those capabilities. (3) The core logistics capabilities identified under paragraphs (1) and (2) shall include those capabilities that are necessary to maintain and repair the weapon systems and other military equipment (including mission-essential weapon systems or materiel not later than four years after achieving initial operational capability, but excluding systems and equipment under special access programs, nuclear aircraft carriers, and commercial items described in paragraph (5)) that are identified by the Secretary, in consultation with the Chairman of the Joint Chiefs of Staff, as necessary to enable the armed forces to

fulfill the strategic and contingency plans prepared by the Chairman of the Joint Chiefs of Staff under section 153 (a) of this title.

c. *Federal Acquisition Regulations*

Federal Acquisition Regulations [27) FAR] are a set of codified and published uniform policies and procedures for acquisition by all executive agencies. With respect to acquiring COTS products, FAR Subpart 12.2 addresses the Special Requirements for the Acquisition of Commercial Items. There are 13 sections to this subpart. Each section addresses a specific issue for the acquisition of COTS items. The section titles are listed below to give the reader a sense of what areas this regulation covers.

- Market research and description of agency need
- Procedures for solicitation, evaluation, and award
- Solicitation/contract form
- Offers
- Use of past performance
- Contract Type
- Contract quality assurance
- Determination of price reasonableness
- Contract Financing
- Technical Data
- Computer Software
- Other commercial practices
- Cost Accounting Standards

The SSB infrastructure must comply with the regulations set forth in the Federal Acquisition Regulations specifically Subpart 12.2 and its policies for acquiring COTS products. Generally speaking, the Federal Acquisition Regulation in terms of COTS implementation has guided government agencies toward a more commercial approach. The individual government agencies should try to achieve a balance between public and private resources that uniquely fit their respective needs. Furthermore, the PMOs within the various agencies should seek appropriate commercial practices for

acquisition and support of commercial items. The contractual arrangements should also reflect this migration to commercial practices to the point that government interests are preserved. Appropriate commercial practices should be actively sought out that proves to be satisfactory to both commercial and government entities and not otherwise precluded by law or Executive Order.

X. ASSUMPTIONS AND METHODS

This section describes the origin and use of the data and the methodologies employed which translates the data into final results. That is how the data was obtained and the methods use convert this data to information. This is crucial for understanding the BCA results and leading to better use for decision-making purposes.

A. SCOPE AND BOUNDARIES

Case – This Business Case Analysis is performed for the Navy's *Ship Self-Defense System MKI* (SSDS). Below is a brief description of the system. [30) Raytheon]

Ship Self-Defense System (SSDS)

The SSDS is a combat system that is used to integrate and coordinate all of the existing sensors and weapon systems aboard a ship. Its purpose is to provide an automated and integrated self-defense capability for U.S. Naval surface ships. The system provides a quick response, multi-target engagement capability against close-in threats. The goal of SSDS is to coordinate existing shipboard resources so that the overall ability of the ship to defend itself is enhanced with respect to the independent, uncoordinated operation of the systems currently installed. To do this, SSDS produces a composite track picture using data from the various sensors on the ship.

The system will eventually be installed aboard most classes of non-Aegis ships.

The SSDS is managed by PMS461

Source:

http://www.raytheon.com/products/ssds/
http://www.jhuapl.edu/programs/airdefense/ShipSD2.htm

Time – The period of analysis is between fiscal year 2003 and 2012. The data obtained for this case study was collected in FY 2002 and applies to SSDS program execution beginning in FY2003.

Organization/Function – The ultimate goal is to satisfy warfighter requirements; however, there are many stakeholders within the SSB infrastructure. To follow are brief descriptions of the major stakeholders

The End User - Certainly warfighter must be considered for it is the end user we depend on to operate our weapon systems and provide the expected defense as defined in our national strategic policies.

The Program Management Offices - This includes the initial acquisition community whose purpose is the acquisition of new systems. They also support the In-Service Engineering Activities (ISEA) that must continue to procure parts as part of an alteration kit or on-going support for the warfighter, that is repair and replacements of parts. They support the Integrated Logistical Support (ILS) functions, which must plan the long-term support of fielded equipment and must support equipment between changes to the equipment baseline. One of their primary responsibilities is budgetary support for personnel who must plan the availability of products that extend over the 2-year Program Objective Memorandum (POM) cycle and the 3-5 year implementation cycle. Additionally they must fund Field Activities or service contractors who prepare Cost, Health, and Risk models, which quantify the availability and supportability of the fielded systems.

Interoperability Support Activities - These activities must obtain and maintain a stabilized baseline in order to keep the certification of the system verifiable. These support activities include not only the initial integration site but also the interoperability of fielded systems subsequent to changes (i.e. installation of replacement parts, firmware, software or hardware revisions, etc.).

Design and Development Activities - These activities must rely on commercial products to be available when the design goes into production.

Production/Manufacturing Facilities - These facilities must rely on the source of supply in producing the systems they were contracted for, which will include commercial products that contain supportability issues

B. SSDS COTS WORKING GROUP

The Ship Self Defense System (SSDS) Commercial Off the Shelf (COTS) and Non-Developmental Item (NDI) Working Group (SCWG) is established to review, evaluate and recommend resolution for COTS and NDI obsolete parts design, technology, application, availability/procurement, and process issues in a timely and efficient manner. The SCWG assists the Program Manager (PM) with identification of COTS, obsolete parts, and technology requirements, clarification of contractual concerns, and compliance with acquisition reform initiatives involving COTS. The SCWG Charter is provided as Enclosure 6.

C. COST MODEL

The cost modeling was accomplished through the use of two unique models combined into one. NSWC Crane provided a traditional Sustainment Engineering cost model (here after referred to as the resource model), which focused on upper level assembly procurement costs and associated resource requirement costs. NSWC Corona developed a procurement cost model (here after referred to as the procurement model) reflecting granularity down to the component piece part level (i.e. below the assembly level) to identify obsolescence issues and their associated cost. The resource model provided a well-established structure and process to perform simulation and evaluation on "What if" scenarios using various support methodologies. However, the resource model lacked the insight to component piece part obsolescence and the capability to quantify their cost impacts or a resolution method addressing this low level. Used independently the resource model addresses obsolescence at the assembly level whereby the potential resolutions were limited to assembly level mitigation resolutions. The procurement model provided initial costs of component piece part obsolescence and projected future year costs at this low level. The procurement model is intricately tied to the SSB system for generation of the necessary data and as part of the SSB system risk mitigation resolution methods are available for component piece part obsolescence. This visibility into the low level obsolescence and associated cost provides new knowledge and resolution methods previously unavailable. Used independently the procurement model can show impacts on procurement costs given various scenarios, however lacks the overarching view to identify impacts to resource costs. Combining the two models

allows the user to leverage the structure and simulation of both the procurement costs and the associated resources available through the resource model while having the visibility of low level obsolescence costs combined with alternative resolution methods. The models were combined by first running the procurement model using a specific scenario then using its' output as an input to the resource model subsection of the Work Breakdown Structure (WBS) labeled – Procurement. Additionally, cost figures were developed to reflect the cost to implement the SSB system, these in-turn were identified in the WBS as SSB resource costs.

1. The Resource Model (Enclosure (30))

Naval Surface Warfare Center (NSWC) Crane Division has developed a Technology Planning and Management Cost Model, which accurately and efficiently calculates the estimated cost of most support strategies required by Navy PMOs. Their focus is on COTS products in military applications. They act as a consultant to PMs and work in conjunction with both government and commercial system designers and integrators, in the life cycle management of systems that incorporate COTS products. NSWC Crane provides technology assessments that help PMs with commercial technology management. The mission of NSWC Crane is "…to provide low cost, quality, and responsive acquisition, engineering, logistics, and maintenance for the Fleet's weapon and electronic systems, ordnance, and associated equipment and components." They accomplish this through "…partnerships with industry, academia, and government activities." [31) NSWC/Crane]

The model was designed based on the cost breakdown structure (CBS) required for proper preparation and submittal of engineering change under DOD-STD-480, whereby it reflects the resources and requirements for a given alternative. Estimating methodology for each category of costs was developed in accordance with accepted and anticipated practices within a specific program community for a technology refresh engineering change, from proposal submittal and approval to installation of the change. Both these costs and activity categories were combined into a high-level breakdown structure and are submitted with a total work breakdown structure (WBS) containing over 120 categories. The high-level WBS is as follows:

- Configuration Management

- Hardware/Software Engineering
- Testing and Documentation
- Procurement
- ILS Planning and Management
- Installation

In order to design a cost model that accurately reflects the cost of a supportability option, the cost analyst had to understand the processes (and associated costs) that are a part of each of the areas listed above. The Subject Matter Experts (SMEs) on the technology assessment team for the program played a key role in assisting the analyst to capture those processes. The NSWC Crane cost model is designed with variables that can be used to describe changes made to the system under a chosen supportability option.

Certain decisions made in the various support scenarios were guided by input from NSWC Crane Division. They prepare a COTS Availability Risk Assessment (CARA) that provides in-depth knowledge of the availability of each COTS item used in the combat/weapon system. Some of the basic availability questions that it answers are:

- Is the manufacturer still making it?
- If not, can we still buy it?
- Can the manufacturer still repair it?
- Is there an after-market supplier for the product?
- Where does this product fit in the company's product roadmap?
- Is the technology (or technologies) used in the design of the product state- of-the-art and widely used in industry?

NAVSEA Crane Division provided the data presented in Enclosure (30). The cost data found in this enclosure was based on cost models generated and used by NSWC Crane in support of the decision making process at the program office level for COTS applications. The information contained in this spreadsheet used COTS specific data for populating the various resource fields. This data includes item failure rate, purchasing price and repair costs. Also, any program-specific information that impacts the support decision is considered and documented in the CARA, such as government sources of supply, system procurement and installation schedules, and quantities of items used in

system design. The actual algorithms are not accessible within this file but are consistent across all applications of its use.

The resource model is designed to offer several methods of supporting a particular component over its life cycle. These different support alternatives are implemented at the assembly level in a typical application however another alternative – After Market (Sunset Supply Base) – has been added which provides low level visibility and resolution of obsolescence. Below are descriptions of the typical methods and the SSB alternative.

Bridge Buys - A bridge buy, referred to as a Life of Type Buy (LTB) in this BCA, is a short-term buy solution to an availability problem. Items are purchased to bridge the time from some point before product obsolescence to a known point in time when a refresh/upgrade is planned. Often a bridge buy is performed while the logistics of the agreed-upon long-term solution become finalized for execution. In essence, a bridge buy should provide the customer some time by solving the immediate availability problem for a period of six months to three years. Bridge buys may be desired for many reasons: 1) inability to accurately assess and predict the lifetime demand, 2) inabilities to acquire funding for a Life-of-Type (3 to 10 year) buy, and 3) a redesign is the desired long-term solution, but budget constraints may delay the effort for a finite term. Guidelines for making the repair/replace decision should be as follows:

- If considering a bridge buy solution, high price items should be investigated for repair as opposed to a bridge buy

- If considering a repair concept, bridge buys should be estimated when the cost to repair is equal to or greater than the cost to replace.

Spares Utilization - Spares utilization may be an option to support the equipment until a refresh/redesign is planned. Typically such spares come from supplies maintained from the prime contractor, from the In-Service Support Activity, or from decommissioned assets tracked by Naval Inventory Control Point (NAVICP).

Maintenance Contracts - Maintenance contracts with vendors are utilized to deal with obsolescence instead of bridge buying an item. This method can be used to support products until a technology refresh and/or end of system life. This concept allows the delay of a technology refresh due to the repair capability after product obsolescence. In most cases, it allows the Program Manager to lower his support cost due to the cost of

repair being less than the replacement costs. This philosophy contains some inherent risk associated with vendor's capability to repair and the repair support period the vendor is willing to sign-up for.

COTS/NDI replacement - Two approaches can be taken for COTS/NDI replacement. For a minor impact solution approach, it is possible that the problem product is replaced by a newer revision of the same product, an entirely new product of the same family. The major impact solution approach consists of a technology upgrade change from the same vendor - or an entirely new product and vendor. Low complexity and cost products will usually fall into the first solution approach category (newer version of the same product). This type of replacement produces a minimum impact on the system. Moderate complexity and cost products can cause a minimal impact and need to be investigated on a case per case basis. Both A and B types require an Engineering Change Proposal (ECP); however, the additional costs incurred by the ECP process are not taken into account. High cost and complexity products will usually cause a major impact, requiring a class I ECP with associated processes, approvals, and costs. The program has the associated risk of impacting the interoperability of the system using either solution.

After Market (Sunset Supply Base) -The after market approach, referred to in this paper as the Sunset Supply Base (SSB), extends the supportability of COTS products and items of material shortage predicated on the needs of the Navy programs. The SSB is an extension of product availability, beyond the Original Equipment Manufacturer (OEM) assigned date to drop the products as obsolete items, which provides stability to the system baseline configuration over a defined period of time between scheduled Technical Refresh/ Insertion points.

2. Procurement Cost Matrices

The Procurement Cost Matrices in this BCA is actually the combined product of two enclosures that are identified and described below at a high level:

- Enclosure (28) – SSDS Assembly Master & Cost Matrices
- Enclosure (29) - SSB Planning Excel Workbook & Data Item Description

The area of measurement and assessments is the Capstone of the entire SSB system's implementation effort. It brings together all the information and data collected and provides functionality previously unattainable without the SSB system - Systems Engineering approach. The Capstone assessment tool is illustrated in Enclosure (28) – SSDS Assembly Master & Cost Matrices. Every tool, method, and process developed to implement the SSB system is either directly or indirectly responsible for the numbers evident in the matrices. Enclosure (29) – SSB Planning Excel Workbook & Data Item Description - provides detailed explanations for the descriptions of each cell along with the mathematical relationships and constraints implemented within the worksheet. Enclosure (29a) – SSB Program Workbook Template – provides a ready to use template with embedded algorithms for immediate application using data generated from another new program. Enclosure (29b) – Formula Helper – identifies in succinct form the equations/relationships embedded within the SSB Program Workbook Template so that at any time the user can check the integrity of the embedded algorithms.

This enclosure (28) provides the procurement cost data for supporting COTS products on the SSDS program under different scenarios. The information is presented in Microsoft Excel@ spreadsheet format. The information has been created to support the analysis of the year-to-year cost and corresponding total cost of supportability options for assemblies in a system. The data used corresponds to the SSDS MK I. Given the complexities of the algorithms and the interrelationships designed into the workbook, explanation of these relationships and manipulation of the data is best accomplished through reading Enclosure (29) in its' entirety. A brief description identified below illustrates the primary information and data considered in developing any given solution set.

The Excel Workbook

The Excel Workbook contains several spreadsheets as listed below:

Global Information:

This data relates to all parts in the system(s) and is used by the calculations of the number of spare parts required and as stopping criteria for the cost matrices. The global information is:

Mission Years: The total years of the Mission life.

Hours per year: The MTBF is given in hours so this is simply the total number of hours in a year.

Percent utilization: The expected percent of time that the system is expected to be operational.

Total Mission Hours: Mission Years * Hours per Year * Pct Utilization

Number of MK I Systems, MK II Systems: This spreadsheet has been seeded with data that relates to the SSDS MK I & MK II Systems. These values represent the number of fielded systems that the data is being generated to support.

Program Year Names and corresponding integer year into Mission: These values are used to display the chosen start year and subsequent years in series on the Cost Matrix spreadsheets.

SSDS Master Assembly List:

Each record in this worksheet is for a particular assembly in the SSDS system. The data is collected from the manufacturers and Navy database information and generated based on the global information and statistical functions based on an Exponential Life Testing model. For an explanation of this model see the section at the end of this section. The Assembly Master information is:

1) Individual Assembly Information:

Unique ID: This is used for ease of reference to an assembly and also for sorting after the data has been imported to a system specific worksheet (i.e. MK I Subset.)

Company: The name of the manufacturer or supplier of the assembly.

Parts for vendor: This is used for a subtotal calculation to logically separate the assemblies by vendor and show the number of assemblies this supplier is providing.

Supplier Part #s: As given by the manufacturer.

2) Pricing Information:

Price per part: The price for each assembly as given by the manufacturer.

Adjusted price per part: This value is the price per part shown above plus 5%. This percentage is in payment for holding, storing and maintaining stock levels of 'Red Parts' (see below) for the Sunset Supply Base (SSB) supportability option calculations.

Non-reoccurring Engineering Cost (NRE): This value is provided by the manufacturer and represents the cost to set up the infrastructure associated with implementing the SSB for this assembly.

Red Parts Price: If the SSB supportability option is used, this cost reflects the price quoted for the parts that are the obsolete parts purchased and stored while still available from the manufacturer or in the gray market.

Non SSB Support Cost: At present this column is not being used.

3) MTBF Information:

Mean Time between Failure (MTBF) given in hours.

MTBF: MTBF is provided from the Original Equipment Manufacturer (OEM) either calculated or demonstrated.

MRDB MTBF: Represents the actual MTBF exhibited in the equipment fielded in Navy applications.

Adjusted MTBF: The most appropriate MTBF from the two listed above or additional adjustment due to performance experience. This value is used for the calculation of the failure rate used in the Exponential Life Testing Model yielding the required Number of Parts to Purchase in Advance.

4) Important Dates:

Used to determine the number of parts to buy in any given year is dependent on the availability of the part and the service time for the part.

EOP: End of Production. The last date that the assembly can be procured.

Years remaining to Buy: Based on the EOP date. The corresponding number of years remaining to buy the part. Used to determine purchase schedule.

EOS: End of Service. The last date that the assembly can be serviced.

5) System Part Information:

Enumerated value: If the assemblies listed are used on one or both systems, a key value can be entered here. These values are used to extract data for an individual system by sorting.

Parts on each System (1): Each Mark I System has this quantity of parts installed.

Total parts for all Systems (1): Uses the total number of MK I Systems from the Global Information worksheet

Parts on each System (2):

Total parts for all Systems (2):

Parts for all Systems: The combined total number of installed assemblies for all systems.

6) SSB Information

Support Method: Currently there are 3 supportability options implemented:

SSB: Use the SSB model for product support, purchase schedule and cost data.

LTB: Life Time Buy. Dependent on the 'Years remaining to Buy' in the 'Important Dates' section. The quantity of parts calculated for purchase in any given year may vary based on the ability to purchase. Also, the entire assembly is purchased. It is implied that this option is for parts that are not expected to have any obsolescence issues.

OTHER: Costs estimates for alternative "OTHER" are based on engineering judgment in the cases involving proposed ECPs were prepared by NSWC Port Hueneme, the In-Service Engineering Activity (ISEA) for the SSDS. In some cases, estimates were provided by NSWC Crane based on reasonable redesign estimates extracted from their cost-modeling tool.

Confidence Interval: The Upper Confidence Limit, $\hat{\lambda}_{\mu}$, allows the calculation of the MINIMUM MTBF that would occur in the given Probability Confidence Interval. Using this value, we can calculate the MAXIMUM number of parts that would be needed to remain within this confidence interval. The value of F (below) used is the Expected Mean Failure calculated with the given MTBF.

Expected Mean Failures (F): Based on the MTBF and the Global Information of Mission Time Hours. Calculates the Expected Mean number of assemblies that will fail over the Mission life cycle. Where:

λ = Failure rate over Time = reciprocal of MTBF

n = Number of Parts for all systems

T = Total Hours of Mission Time

F = Expected Mean Failures = λ*n*T

Number of Parts to Purchase in Advance: From the information for Exponential Life Testing, the number of parts to purchase in advance represents the maximum amount that may be needed based on the % confidence interval.

Average Parts Per Year: Simply divides the total number of parts calculated for the corresponding confidence interval by the Mission Time in years. Used to determine the minimum number of parts to purchase in the earlier years of the Mission.

System (1) Subset:

This worksheet is created by taking a subset of the Master Assembly worksheet and using the 'Past Link' function available in Excel. This allows for the values to reflect exactly the corresponding values from the Master.

System (1) Cost Matrix (1):

This worksheet contains the individual formulas to calculate the number of parts to buy in a given Program Year and the associated cost. Each Fiscal Year has six columns, two, which are visible, and the other four, which are Grouped and Closed. The first two columns are for the supportability option of SSB. The second two columns are for the supportability option of LTB. The supportability option of OTHER is imported from the final worksheet, which has rows for each assembly and will contain assembly specific information. This information was provided by the ISEA and the information corresponded to the sum total of parts purchased and resources consumed.

Use of the Exponential Life Testing Model gives:

F = Failures occurring in the system over the accumulated time T0

F is P (λ T0), the probability of occurrence is a Poisson Process

$$\hat{\lambda} = MLE = MVUE = \frac{F}{T_0}$$

Where:

MLE is the Maximum Likelihood Estimator and

MVUE is the Minimum Variance Unbiased Estimator

The Upper Confidence Limit of mean failure rate: $\hat{\lambda}_\mu \, for \lambda$ is: $\hat{\lambda}_\mu = \dfrac{\chi^2_{\alpha,2(1+F)}}{2T_0}$

Where:

α = 1 – Probability, i.e. 99% Probability gives α = 0.01

Reliability R (t) = P (T0 > t) = e-λt

Failure Density function f (t, λ) = λ e-λt

The Upper Confidence Limit, $\hat{\lambda}_\mu$, allows the calculation of the MINIMUM MTBF that would occur in the given Probability Confidence Interval. Using this value, we can calculate the MAXIMUM number of parts that would be needed to remain within this confidence interval. The value of F used is the Expected Mean Failure calculated with the given MTBF.

B. SUPPORT METHOD SCENARIOS

In this case study there are three main practical scenarios that could be implemented to support the SSDS program over the defined ten-year period and each are described in a separate worksheet labeled with the names identified below.

1. LTB(1)

This scenario is the likely track for COTS product support without any assistance from the SSB infrastructure. The costs for this scenario are the estimated financial impacts that the SSDS Program Office must plan for. The support methods are broken down into two methods: 1) Life Time Buy (LTB), which is a bridge buy as described previously, and 2) OTHER. OTHER refers to redesign, spares utilization, reclamation from other fleet assets or maintenance contracts.

2. SSB(1)

This scenario is the most appropriate implementation of the SSB infrastructure as agreed upon by the SSDS COTS Working Group (SCWG). Three main support methods are employed: 1) SSB, 2) LTB and 3) OTHER as described above.

3. SSB Optimized

This scenario implements the SSB method wherever possible. Certain support decisions were made for specific COTS products prior to the availability of the SSB infrastructure. Some COTS products have already been slated for redesign or reclamation efforts.

In addition to these scenarios, three additional scenarios are identified. These represent the "What-If" scenarios.

- LTB Only – This scenario uses the LTB support method for all COTS products.
- SSB Only – This scenario uses the SSM support method for all COTS products.
- Complete Tech Refresh – In this scenario every COTS product within the SSDS is planned for redesign or technology refresh over the next ten-year period.

C. CURRENT STATE ASSESSMENT

Military acquisition is characterized by high development costs and very long development cycles; therefore military procurements are forced to project future needs and purchase as many products or components as they think they will need. Furthermore, in light of unique military applications, the lengthy life cycles and the 5 to 7 year technology refresh rate, the DoD realizes that they presently have no control over product evolution, and therefore must compensate by staying aware of pending changes. This is critical if the military is to expect any appreciable success in support of their weapon systems. Operational and maintainability support is expected over the entire life cycle of the system. This includes support for design and development efforts as well. As mentioned previously, DoD design and development cycles spanning 10 to 15 years, are expensive and often deploy out of date equipment. These design and development activities must rely on commercial products to be available when the design goes into production. Furthermore, production and manufacturing facilities must rely on the source of supply in producing the systems they were contracted for, which will include commercial products that contain their own supportability issues.

The impacts of ineffectiveness to support our weapon systems throughout their life cycle will be realized in military readiness and capability. When we consider the huge investments that DoD makes in getting technology to the warfighter and training our warfighter, support of our weapon systems should not be the weak link in maintaining high levels of combat readiness and personnel safety. This weak link might be the result of the ever-increasing pressure to reduce costs. Very often we hear of cost as the independent variable in design and development efforts and that Total Ownership Costs (TOC) should be factored into the design process. To do this the design activities must maintain a holistic perspective of the system to include life cycle support of technologies that have been selected for insertion into their weapon systems. With the challenge of reducing costs and effectively supporting the warfighter, today's systems architects for DoD systems must understand what drives cost in order to carefully consider alternatives for life cycle support.

The cost associated with supporting weapon systems throughout their life cycle is perhaps most sensitive to the availability of components that are needed to maintain stability in the operational context. As legacy systems age, their associated support and maintenance costs rise dramatically due to obsolescence, reliability and supportability problems while at the same time the performance of the system decreases. As original equipment manufacturers synchronize their product lines with technology, products presently deployed in DoD weapon systems, as well as products intended for use in developmental systems, will be affected. Alternate components or parts will need to be considered for acceptance or rejection. There will be material shortages occurring because of the social, economic, and political environments. In either case there will be costs associated with these decisions and cost must be managed effectively. If the alternate part is accepted, an engineering change proposal will need to be initiated. There is cost associated with preparation, coordination, scheduling and testing of the alternate part. If the alternate part is unacceptable, large product buys will be needed to ensure operational integrity and support of the system over its life cycle. There is cost with developing a new source of supply. In these cases there are issues of where to buy, how much to buy, where to stock them, and how to manage the costs and logistical support to meet the needs of the customer.

Recently, the Navy has gone to a concept called Performance Based Logistics (PBL) in an effort to provide the fleet with increased reliability and availability at the same or reduced cost. The Naval Inventory Control Point (NAVICP) ensures that PBL arrangements meet the requirements of the fleet. In essence, under a PBL arrangement, a single supplier provides material and support to the fleet consistent with the Navy’s requirements. This contract is executed without the intervention of, or need for government inventory managers, storage, material handling, and transportation systems. The goal is to provide increased availability, reliability, technology insertion, and obsolescence management at a lower cost to the Navy. They use a Business Case Analysis (BCA) approach to determine a ‘best value’ approach given reduced funding. For each PBL initiative, NAVICP will conduct a BCA. This BCA is designed to quantify any cost benefits the Navy will realize through the initiation of a PBL contract. The BCA process involves determining the Navy's current cost of doing business. This "without

PBL" cost is then compared to the cost to the Navy if they execute a PBL arrangement. This "with PBL" cost includes both the PBL supplier's costs as well as the residual costs the Navy will retain even under a PBL arrangement. All savings must be quantifiable and traceable.

Under this arrangement, the supplier is contractually bounded to deliver the prescribed capabilities a defined period of time. Performance of the supplier is continually assessed against the terms of the contract. Consider a typical contract period of five years and assume this is the first contract this particular supplier has received. At some point in the five-year period, a COTS obsolescence issue may arise. If this occurs even within the first year, recall we expect a 2-3 year planning period to solve the obsolescence issue and another 5-7 year implementation effort, easily exceeding the five-year contract period. So in essence we are continually outdating ourselves because we cannot keep up with commercial technology turnover. Given the DoDD 5000 guidance and the institutionalized budgeting and planning process for appropriations, the only alternative is to extend supportability for those near-obsolete COTS products so that a more effective planning and execution phase can take place. This newly developed scenario should provide enough flexibility so that changes during the acquisition cycle will have minimal impact to the program.

D. CURRENT STAKEHOLDER ASSESSMENT

1. Program Management Office

The PMO through its Integrated Logistics Support (ILS) group orders COTS assemblies through the normal support systems by contract, purchase order, or Navy supply system. If an OEM no longer supports a product, then the PMO must look for another avenue to solve the issue, typically an engineering analysis and review is necessary yielding a variety of solutions most of which are very expensive. If the PMO is lucky or just well informed (which is not always the case), the OEM will provide a notice stating an “End Of Life” (EOL) date after which the OEM will no longer support the specific COTS product. At this point the PMO must make some choices. Regardless of the choices made, the PMO incurs a significant amount of risk usually at a hefty price.

2. Original Equipment Manufacturer (OEM)

The OEM is usually a leading edge technology/design firm that is market driven and produces at high volume and cost reflective of commercial economies of scale. The fast paced environment requires short-lived products (~18-24 months) to keep up with the ever-changing technology. The business case is just not there to cater to the DoD/government's needs and although the OEM wishes to keep this group of consumers, the momentum of the business cycle keeps the OEM focused elsewhere. Under these circumstances supportability is limited to production run time (~18-24 months) with approximately a 12-month follow-on repair and test capability period.

3. Small Business (SSB Supplier)

The SSB supplier is envisioned to come from the large base of smaller suppliers who, over the past three decades, have provided the DoD/government with high tech. custom products. Using this supplier base will reduce the risk caused during the technology transfer process because of the proven track record earned when dealing with other DoD/government products. However, this will be a collaborative process and the final decision will reside with and between the OEM and the SSB supplier. Here the OEM holds the trump card and must be willing to live with the choice. The small business SSB supplier typically has extensive technical know how in the manufacturing area but lacks the expertise to accomplish proactive, predictive obsolescence management. These companies are customer focused, agile, and seek long-term relationships with their customers.

4. DoD Navy Field Activities/Resources

Most, if not all, of the functions identified in Figure 2 (17-Step SSB Implementation Process) are already accomplished by internal DoD/government resources; however they are done in an ad-hoc fashion without the collaborative environment, and with no defined, supportable, and repeatable process in place. The expertise has always been available in the DoD/government but in a different form using a different process. Prior to Acquisition Reform, the MIL-Specs and standards provided a requirements-rich environment with well-defined processes for implementation. These processes and implementation methods required the same expertise needed today but

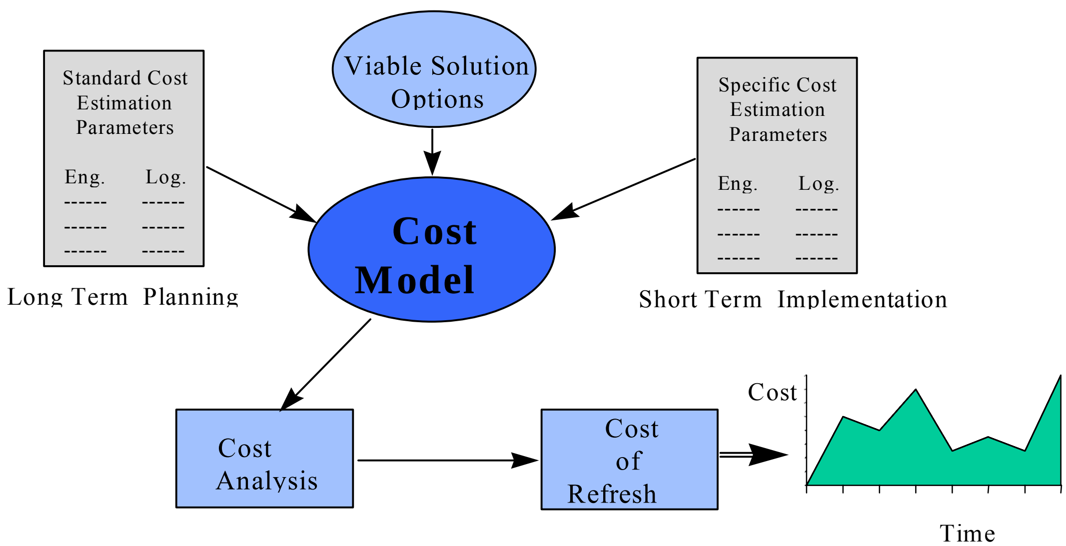
applied in a different context. Today's environment is requirements-poor, and the talented expertise must adjust to this performance-based versus MIL-Spec-based environment. The context in today's environment is relationship-based, not rule-base, and the survivability of this entire group of talented experts will depend on their adaptability to today's context. Acquisition Reform removed the barriers put in place by the MIL-Spec, rule-based environment, but it failed to provide an adequate substitute, which would provide a robust process that can meet the supportability requirements and needs of the end user.

E. FUTURE STATE ASSESSMENT

The future impacts, as a result of SSB implementation, are an environment where various support scenarios are defined and ready for service to the particular program. A team approach is envisioned to assess the current program state in terms of support and performance requirements. They will also evaluate all possible mechanisms for reaching these objectives. This team effectively performs a solution analysis for a particular program and produces draft scenarios to the customer. The customer examines the scenarios for appropriateness and feasibility. If necessary, the scenarios are modified, expanded upon, rejected, or split into multiple scenarios. Identifying various life cycle support management strategies helps the PM select a strategy, which best fits, their requirements. Cost/risk trade-off and availability of support funding play major roles in determining the strategy that best suites each individual programs requirement. Proper life cycle management of military weapons systems and their associated product implementation is critical when commercial products are used. As the commercial product content of military systems increases, the number of required product upgrades and technology refreshes within the system will increase. Engineering changes must be processed to overcome obsolescence problems, meet new performance requirements, or provide more cost efficient support. Resolving these types of issues requires a phased technology management approach that: assesses the technical and supportability status of current equipment; identifies solutions to overcome recognized problems; and provides a life cycle cost analysis to determine the costs over the time of implementing solutions.

The future infrastructure shall address the development of a cost estimate for technology refresh. Several cost estimating tools exist for system life cycle costs but do

not adequately address the unique cost elements of a technology refresh. A cost model that is effective for use in the technology assessment process must be designed to work whether or not specific system hardware or software has been chosen and project costs for items that may not exist at the time of analysis. In order to accommodate this, NAVSEA Crane Division provides a technology planning and management cost model that uses either standard cost estimation parameters or specific cost estimation parameters, depending upon whether specific upgrade hardware has been chosen. This concept is shown in Figure 8.



Appendix C Figure 8: Cost Estimating of Support Options

The costs associated with multiple platforms and shared costs associated with common platforms are taken into account in the cost estimate by identifying the different classes of platforms and the number of occurrences where the system is to be installed on each platform class. Commodity consumption, assets on-hand, and replacement cost data are used when determining the most cost effective refresh strategy. For example, insertion of new COTS equipment may allow for redistribution of available repair assets in the supply support pipeline, thereby solving two logistic support problems with one COTS insertion.

The support strategy is crucial to the success of the program in terms of availability and readiness as well as cost. In fact the creation of various support strategies helps to quantify refresh costs. The refresh costs become an important tool in identifying

a preferred method of replacement. Typically, three solution approaches may be portrayed in the cost estimate:

- Single Item Refreshes - The costs associated with single item replacements based upon market trends. The target dates of the refreshes are approximate to the end of production and prior to end of support.
- Single Block Refresh - The refresh includes all items within the configuration that are at risk due to availability or changes in mission requirement. A refresh date is selected and costs applied to implementation of the change.
- Multiple Block refreshes - Blocks of items are defined based upon technological trends and their relation to functional blocks within the unit or system under analysis. Plans are established to refresh these blocks over the life cycle of the system. Costs are applied to the implementation of this approach and graphed for comparison with other approaches.

Additionally, the process of cost estimating can be used as a program management tool to identify drivers within a particular refresh approach for further analysis. These drivers may be candidates for improvement in the process of engineering and supportability analysis. In order to summarize the results of the analysis, a model is employed that totals cost estimates and compares work efforts with trends and known requirements. The model is a simplified representation of the real world, which abstracts the features of the situation relative to the problem being analyzed. It is a tool employed by the analyst to assess the likely consequences of various alternative courses of action being examined. The model, in itself, is not the decision-maker, but is a tool that provides the necessary data in a timely manner in support of the decision-making process. It is a way to let the collected data drive the decision to plan for a technology refresh. Specific data requirements are identified from the evaluation criteria and from the input requirements of the model used for evaluation purposes. The objective is to accomplish the analysis keeping in mind the interface relationship between logistic support and the hardware or software choice for resolution of the problem. In performance of the cost analysis, there may be a few key parameters about which the analyst is very uncertain (due to inadequate data, pushing the state of the art, etc.). Therefore, the analyst will run a trade-off analysis in which the model is run several times using different key input parameters to determine the effect on the results. Variation is accomplished by applying different multiple factors to the input parameter being tested. As a result, the analyst will be able to readily determine whether or not to probe further in an effort to provide

improved input data or to select an alternative that is less risky. Inherent in the process of cost analysis is the aspects of risk and uncertainty since the future is, of course, unknown. Risk analysis will explore these various aspects and document assumptions that had to be made in completing the analysis.

A risk analysis is performed in order to avoid the road, which leads to crisis management, a resource-intensive process that is normally constrained by many obstacles. An up front look into the associated risks of different solutions allows planning to avoid the crisis and maintain system readiness. Risk is considered the probability of occurrence of a particular adverse effect upon the planning and estimating for technology management. A method of analysis is employed to quantify variables associated with a set of solutions that may affect the outcome of planning. In other words, the process of developing solutions is reviewed to determine what risks are associated with each solution and which ones are significant. These risks are categorized as low, moderate or high based upon their likelihood of occurrence and the potential impact. Three key assumptions are made that are at risk:

- Failure data used in calculations is accurate for the period under analysis,
- Life-cycles for commercial products used to set technology refresh initiative dates and to procure bridge buys is accurate
- System operational requirements will not change through the systems life cycle either from mission requirement changes or system interoperability requirement changes.

If failure data is inadequate, the greatest impact will be to schedule in terms of the application platform mission readiness. Quantities procured for bridge buys would be affected by individual product but it is believed that the aggregate effect would be insignificant. If product life cycles varied from those used in planning, both the scheduling of technology refreshes and bridge buys would be impacted. This is again a schedule risk. Finally, if the system operational requirement changes due to changes in the mission requirement or interfacing systems on a single platform, two cost impacts may occur:

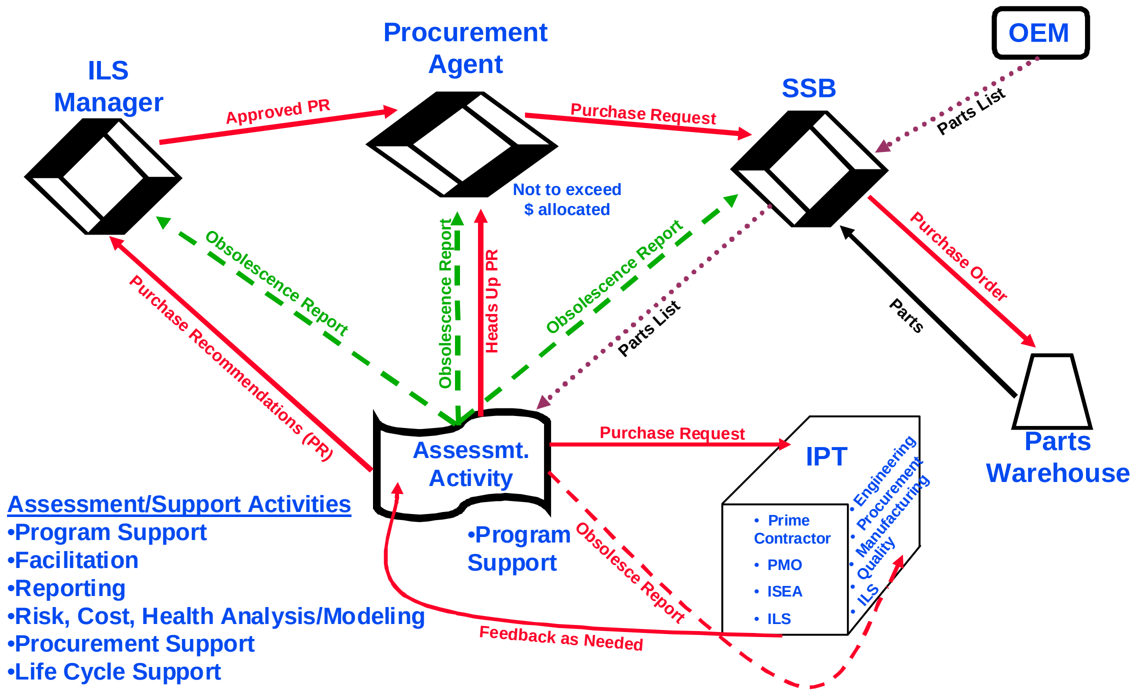
- Quantities of bridge buys may be excessive or short of needs
- Engineering estimates for implementing a technology refresh may be short of requirements

Reduced government funding and manpower levels have further emphasized the need to improve life cycle management processes. Perhaps the focal point for this effort is COTS risk mitigation during development and for fielded weapon systems. This type of continual assessment is needed to offset the fast technology update cycle experienced in the commercial realm. This will provide system baseline configuration stability and supportability. Key to this is the need to continually assess original equipment manufacturers. This assessment should provide valuable insight to the vendor's stability, which in turn impacts the level of risk associated with specific components employed by the DoD. Such assessments would perhaps look at how limited a vendor's product line is and/or make judgments on the potential of specific products in that line to change or disappear. To this end, it becomes important to determine the likelihood that a vendor will continue to provide DoD assets and the consistency of that product line. The challenge is in the architecting of a process that is proactive, disciplined and systematic, and will consider and address the needs as discussed here for the intended audience. The audience being those customers or stakeholders whose needs must be fulfilled

F. FUTURE STAKEHOLDERS ASSESSMENT

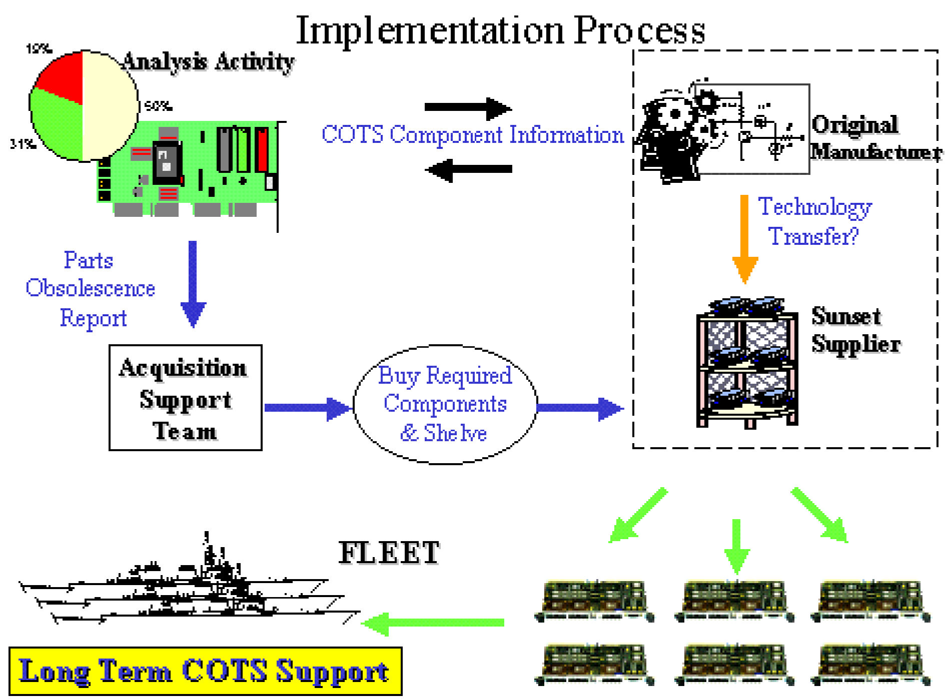
1. Program Management Office

The collaborative process is illustrated in Figure 9 and shows the relationship and informational interfaces between the PMO and the other identified players.



Appendix C Figure 9: Collaborative Processes

Figure 10, Implementation Process, shows the process flow at a functional level delineating the relationship each player has to the others during the SSB development. As a collaborator in this process, the PMO provides the funding resources to internal government activities to facilitate, assess, and report. Also, the PMO is agreeing to pay for the implementation of the SSB system and provide the Bill Of Material (BOM) for the system under consideration. For their efforts the PMO receives: 1) an alternate long term supplier of the COTS product and a relationship with that supplier and their associated OEM that may be extended for other OEM discontinued items, 2) as identified in Figure 9, a continuous update to the risk identification and mitigation efforts, proactively adjudicating obsolescence issues seamlessly on behalf of the PMO, 3) provides the PMO with a corporate knowledge data base on which future decisions can leverage, 4) although not identified through the figures, the program gains reparability and testability attributes over the life cycle of the system defined by the Navy's needs. The method of communication being online is nearly in real time so the effort expended by the PMO is minimal. Product ordering is done using current procurement methodologies.



Appendix C Figure 10: Implementation Process

2. Original Equipment Manufacturer (OEM)

The OEM for their part in the collaboration effort has a lot to gain and little to lose. There is a business case to be made for making a profit from their intellectual property they no longer find useful. The 5-15% royalty is the incentive, but other non-tangible benefits enhance the business aspects in favor of the collaboration effort. Protection of their proprietary design is an inherent part of the SSB process through “Non-Disclosure Agreements (NDA)” and contractual mechanisms. Important to note is that the contractual arrangements are made with another company, the SSB supplier, not the government, which many OEMs find favorable since governmental red tape would poison the business case. This situation leaves the ownership and control of the commercial products in the hands of the industry. Additionally, the government does not have to pay for the design only the product, a tenet of Acquisition Reform. By participation in the collaborative system the OEM establishes a long-term relationship with the DoD/government without the ongoing supportability issues. In turn these new emergent properties of the system can be used to enhance the ability of the OEM to market enhanced product supportability, not only to the DoD/government environment, but also any entity, which is configuration constrained due to the business constraints (i.e.

refineries, paper mills, electrical power generation and control applications, etc.). The OEM efforts are concentrated during the establishment of the SSB supplier and play a crucial part in assuring that the OEM reputation will be in safe hands when the SSB supplier delivers products. The OEM however does agree to allow the internal Navy resources visibility into the products design by letting the SSB supplier share the parts list complete with associated component vendor information along with a top level assembly drawing. This is information the government has not been privy to in the past but it is essential for accomplishment of risk analysis and yielding the desired emergent properties of the system.

3. Small Business Supplier (Sunset Supplier)

As for their part in the collaboration process, the SSB supplier must be willing to be contractually bound by the agreement with the OEM and at the same time be willing to work the internal government resources to coordinate and facilitate supportability efforts while reducing risk to the program. Actions required by the SSB supplier will include:

- Sharing the OEM parts list and drawings.
- Be the purchaser, stock handler, and storage facility for parts that have gone obsolete and are awaiting consumption once an assembly order is placed.
- As requested by the program, be willing to stock all up assemblies (which have already been paid for) to enable immediate turnaround times of fielded assemblies, which have failed.
- Accept all the responsibility for being the prime supplier of the subject assembly.

In return for its efforts the SSB supplier is rewarded through:

- A new relationship with a pre-eminent commercial firm.
- A new product line.
- New customers, DoD/government and non-government.
- Long term relationships with the new customers which enables long term business planning.
- Technical partnering with internal DoD/government resources not only for predictive obsolescence management but a whole host of other specialties.

4. DoD Field Activities/Resources

The internal DoD/government resources have a very crucial role to play regarding the supportability of all our systems from design to fielded systems. Supportability is an inherently governmental function for several reasons: 1) the motivation of our internal resources is in support of the end user needs; this perpetuates and enhances our positions and esteem, 2) due to the overarching scope and the long term broad based characteristics of supportability issues, no one prime contractor could, without conflict of interest, accomplish these functions, and 3) No entity has or even wishes to obtain the corporate knowledge maintained by our internal resource pool. The collaborative environment as is evident in Figures 1, 9 and 10 embeds the talented expertise into the SSB process in a way, which leverages these resources and creates a value stream for the program. The relationship building characteristics of our internal resources is very evident in Figure 9 where this crucial resource takes "center stage" in enabling the collaborative system. Taking both figures (1 & 9) in concert it is easy to see how the resource can gain program equity and support by reducing life cycle costs (LLC), extending supportability of systems, and reducing program risk

XI. ANALYSIS

A. BUSINESS IMPACTS

In this section the potential financial consequences will be presented along with specific areas of benefit to the business process. An analysis of the cost data will be presented in the form of data summaries in an effort to answer the questions stated at the beginning of this document. The data will be offered in an objective and direct manner so as to keep interpretations and explanatory text to a minimum. This section will address the direct financial impacts as well as contributions they make to the business objectives. And finally, an alignment between the financial model and the business needs will be offered that will provide a summary of results, to include non-financial impacts, as well as a statement on feasibility.

B. FINANCIAL MODEL

The purpose of the financial model is to collect, manage, and analyze cost data. In this way, the model essentially converts the data into information in a convenient and easily understood format. For this business case we are looking at the life cycle costs (LLC), over a 10-year period. LLC estimates are typically given for the life cycle of a system and in particular for capital programs. The LLC usually provides the total cost of acquiring, installing, using, changing and disposal across the entire life of the system. In this case, we target only the period between technology refresh dates. This specific interval (i.e., time periods between initial fielding of the equipment and the next technology refresh) is the appropriate application for SSB System's use. Since it was designed specifically for these intervals, the SSB System provides the largest potential benefit to the program. The SSB process, as stated previously, is meant to stabilize the system baseline between technology refresh dates and thereby ensure supportability for this period. The program management team determined the 10-year cycle. Nevertheless, similar cost data could have been derived and analysis performed for any technology refresh period. The information presented in this section (*Financial Model*) addresses only the costs aspects of supporting the SSDS under different scenarios. In this way, the analysis will provide expected future support costs for budgetary planning purposes, as

well as identify potential problems or opportunities. Non-financial benefits will be offered in subsequent sections. Together they support the decision-making process that leads to the most effective supportability strategy.

Six different support scenarios were prepared by running the Cost Model using the SSDS MK 1 data set. A scenario consists of a chosen combination of the various support methods for each COTS item, the three choices included: Life of Type Buy – LTB, Sunset Supply Base – SSB, or Refresh. These scenarios were put into two groups for side-by-side comparison (within a group) of impacts due to type of support chosen.

The first group consisted of three scenarios, each on a separate worksheet in the Cost Model workbook of Enclosure (28) labeled with the following names – LTB(1), SSB(1), SSB optimized. These scenarios varied the amount of involvement the SSB system was employed, as evident through the following descriptions:

1) LTB(1) – Is a bridge buy of all procurable COTS products, NO SSB used
2) SSB(1) – Is the scenario that the SSDS COTS Working Group decided to execute. Implementation SSB system at 75% of potential candidates.
3) SSB optimized – Reflects the implementation of SSB process for all presently procurable COTS products and where the OEMs were willing to participate, this would represent 100% SSB system utilization with the given constraints.

The second group presented the exclusive use of only one of the support methods at a time showing the global, aggregate impact on the supportability costs over the interval. Due the constraints on the SSDS MK 1 many of these support choices are not feasible but the comparison is provided to show a notional impact if given the right constraints what the potential outcome would be. Identification of these worksheet names in Enclosure (28) and potential cases for using these support methods are as follows:

1) LTB only – LTB used for all COTS products, NO SSB & NO REFRESH. This type of support method is sometimes used at the beginning of a systems life to insure supportability over a given period.
2) SSB only – SSB used for all COTS products, NO LTB & NO REFRESH. This type of support method must be implemented before irreversible obsolescence takes place on any of the items, typically this would be done as soon as possible after a design baseline is defined.

3) Refresh only – “Refresh only” reflects a situation where a program will chase the changing technology, resulting in a redesign every time a COTS product becomes obsolete. These obsolescence dates are identified by the End-of-Production (EOP) dates, information published by the OEM and documented in Enclosure (28). This type of support solution typically necessitates an open systems architecture to be cost effective.

Financial models were developed for the use of evaluating the impact of implementing various support options given the SSDS MK1 data set. The Financial Models were primarily derived using the Cost Model, identified in a previous section of this BCA, with four additional constraints requiring manually calculated cost data. These four cost areas are explained in the subsequent text as Variants 1-3 and “Red Parts” costs. This additional information allows modification of the general Cost Model to accommodate for special program needs or implementation of alternative risk mitigation methods (i.e. ECP, ISEA actions). In assigning a support method to the affected COTS products covered by one of the “Variants” a label of “Other” is given to them in the worksheet column “Support Method” of Enclosure (28). Taking the Cost Model outputs and combining them with this additional information adequately describes the cost impact in supporting the SSDS MK 1 over the 10 year support window. Enclosure 28 merges all costs together to provide the total supportability costs over the 10 year interval.

1. First Variant

The COTS products that have been determined to be near obsolete and unsupportable must be redesigned. Enclosure (30) (Resource Cost Models, worksheet ‘Required Tech Refresh’) provides the resource cost model for those COTS products that will have to be replaced in the 2005-6 timeframe and bridge buys are not possible. Based on market surveillance, NSWC Crane determined that nine COTS products are affected.

1) Aydin 19" CRT Monitor (replaced with flat panel)
2) 4 mm DAT Drive (replaced with similar product)
3) Electro Luminescent Panel (replaced with similar product)
4) Ethernet Network Card (VLANME2 being refreshed to VLANME3)
5) Red Rock 2.1 G drive (replaced with next generation product)
6) FDDI DAS replacement (pulling half of the cards in each configuration and replacing with slot bypass boards)
7) Concentrator replacement (pulling half of the cards in each configuration and replacing with slot bypass boards)

8) NTDS Type A/B (replacing 530-2000-001's and 530-2005-001's with 530-3000-001)
9) Red Rock Dual DAT (replaced with next generation product).

The SSB process team has deemed these items as OTHER and a redesign effort to accommodate replacement of these items is necessary. This worksheet represents a simulation model to estimate the potential cost impact of all nine items that require technical refresh/insertion, which means implementing a new design or configuration. The following table is taken from the worksheet and shows the total cost for each WBS element and a total additional cost to the program of $7.063M.

WBS Element	Total ($K)
Total	**7063**
Configuration Management	**126**
Hardware/Software Engineering	**1684**
Testing And Documentation	**944**
Procurement	**3866**
ILS Planning and Management	**337**
Installation	**107**

Appendix C Table 2: Total Support Costs (Required Tech Refresh, 9 Items)

This amount is essentially the total cost to replace all nine items through analysis, redesign and installation in the Fleet The SSB process was not applied to these COTS products as a cost avoidance measure because of timing. By the time the SSB concept was implemented for the SSDS MK I, commitment was made to replace these items with a redesign. Subsequently this cost must be added to all three scenarios to get a total cost of support over the ten-year cycle.

2. Second Variant

For each worksheet in the procurement model there is a value of $1,300,000 under Sub-Total for Program Year 1 as shown below.

Program Year 1			
Supplier Part #	**Support Method**	**# Buy**	**Sub-Total-$ Cost**
PT-VME610A-10534	OTHER	0	$1,300,000.00

Appendix C Table 3: Engineering Change Proposal Costs: Second Variant

This value is based on preliminary data determined from actual Navy supply research by the In-Service Engineering Activity (ISEA), NSWC Port Hueneme and is a conservative estimate of implementing an Engineering Change Proposal (ECP) to perform engineering analysis, design, test and installation in the Fleet.

3. Third Variant

For each worksheet in the procurement model there is a value of $102,877.00 identified as Total Other (Misc.) for all cost matrices.

Total		$5,820,641.00
	Total Other (Misc.)	**$102,877.00**
	FY 03 Total	$5,923,518.00
Total Red Parts		
Net Present Value	$6,795,517.54	

Appendix C Table 4: Miscellaneous Costs: Third Variant

This value comes from the worksheet titled *'Special Data for MK I'*. This value represents the costs associated with the items that are not covered in the cost matrices: and not part of the '*SSDS Master Assembly List*' worksheet. These items are unique and must be purchased to support the program. Consideration is being given to extending the SSB concept to these items at the request of the PMO. These items tended to be low cost and supported by a bridge buy. This figure is found in all procurement cost matrices.

4. Red Parts

Red Parts are those items that are dangerously close to being obsolete and must be purchased in order to support the production of the COTS product.

	Column I			
	Total			
		Total Other (Misc.)	$102,877.00	
		FY 03 Total	$3,058,736.27	
Total Red Parts Cost	**$520,240.57**			**$26,012.03**
	Net Present Value	$6,021,954.17		

Appendix C Table 5: Red Parts Cost Example

The Red Parts cost for FY03 was calculated from the aggregate of all 'Red Parts' costs for each COTS configuration. This value is presented in Enclosure (28) *"SSDS Assembly Master and Cost Matrices"* in column I. Our implementation experience has shown that the rate of increase of obsolete parts (Red Parts) increases at the average rate of approximately 5% per year. To account for this increase in future years, we have projected that this increase could provide a good estimator for the amount of budget needed in the out years.

As evident in the procurement cost models, the FY dollars needed each year is calculated as follows:

[We will use worksheet '*SSB (1)*' values to demonstrate]

```
FY03 = $520,240.57

FY04 = ($520,240.57)(0.05) = $26,012.03

FY05 = ($520,240.57 + $26,012)(0.05) = $27,31.63

FY06 = (FY03 + FY04 + FY05)(0.05) = $28,678.26

. . .

FY12 = (FY03 + FY04 + - - - - -  + FY11)(0.05) = $38,431.61
```

In an effort to compare same year dollars from different scenarios spread over the 10 year interval, calculations of Net Preset Value (NPV) were done to compare the support costs in FY 03 dollars. NPV calculations were based on a rate of 5.1% across the period of analysis as required per OMB Circular-A94. [32) OMB]

There are two enclosures from which we have derived the following results.

- Enclosure (28) - *SSDS Assembly Master and Cost Matrices* – provides the detailed procurements costs for each scenario.
- Enclosure (30) – *Resource Cost Models* – provides the detailed resource costs needed to set up and maintain each scenario.

The procurement costs for the resource cost models was derived from the procurement costs calculated in Enclosure (28). In this way, the two enclosures are linked and represent a consistent picture of the costs needed to execute this analysis.

Sunset Supply Costs	8404
Operations Cost	1550
Component Surveillance	650
Sunset Supply Industry Interface	650
Sunset Supply Set Up	250
Procurements	**6854**
Red Parts Cost (5% of inventory per year)	287
Procurements of Replenishment Spares	6567

Taken from Enclosure (30)

0.038% error

NPV Total		$6,021,954.17
Grand Total		**$6,851,397.68**

Taken from Enclosure (28)

Appendix C Table 6: Procurement Cost Example

One final note, for each scenario (LTB(1), SSB(1) and SSB Optimized) there is an additional cost of $701,217 for consumed inventory. This is the amount that has already been invested for providing spares. This amount will be considered when we address total support cost in the Analysis of Results section.

C. RESULTS

As previously mentioned, there is a cost ($7.063M) associated with 'Required Tech Refresh' that must be included for each of the three scenarios 1) LTB(1), 2) SSB(1), and 3) SSB Optimized to get an overall cost to support the SSDS over the ten-year period. Since this cost is unchanged due to the scenario, we have excluded from this part of the results discussion. The focus here will be on the total support costs and procurement costs minus the costs due to a required technical refresh or redesign.

All cost figures are given in $K, unless otherwise stated.

The first chart illustrates the total support costs due to implementing a given method.

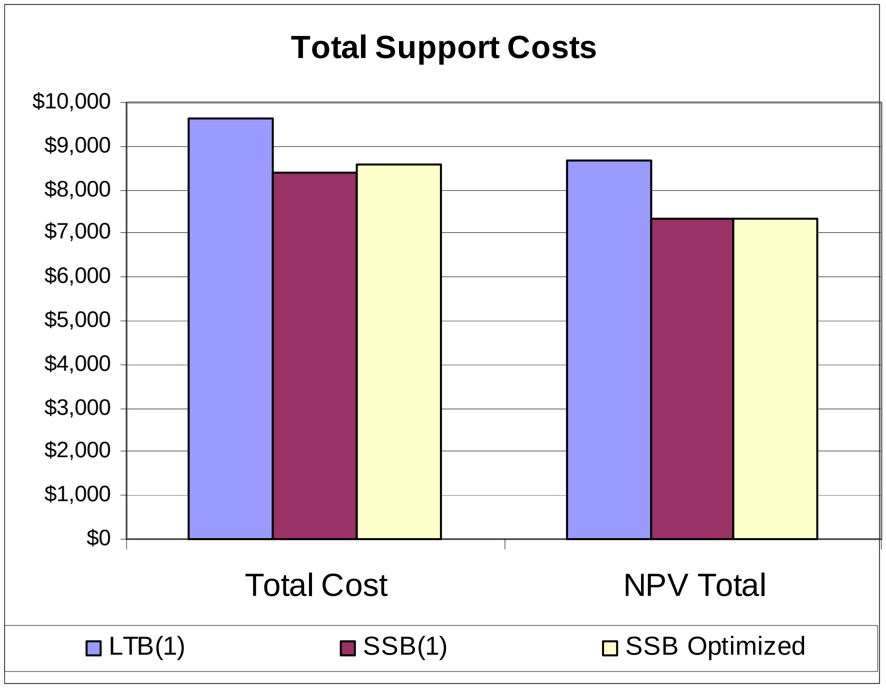


Chart 1: Total Support Costs (LTB (1), SSB (1), SSB Optimized)

The overall total support cost is highest when implementing the LTB(1) method. Implementation of SSB (actual or optimized) provides a cost reduction of approximately 15% as compared to a traditional LTB approach.

If we look at how these costs are allocated over the ten-year period we get the following profile.

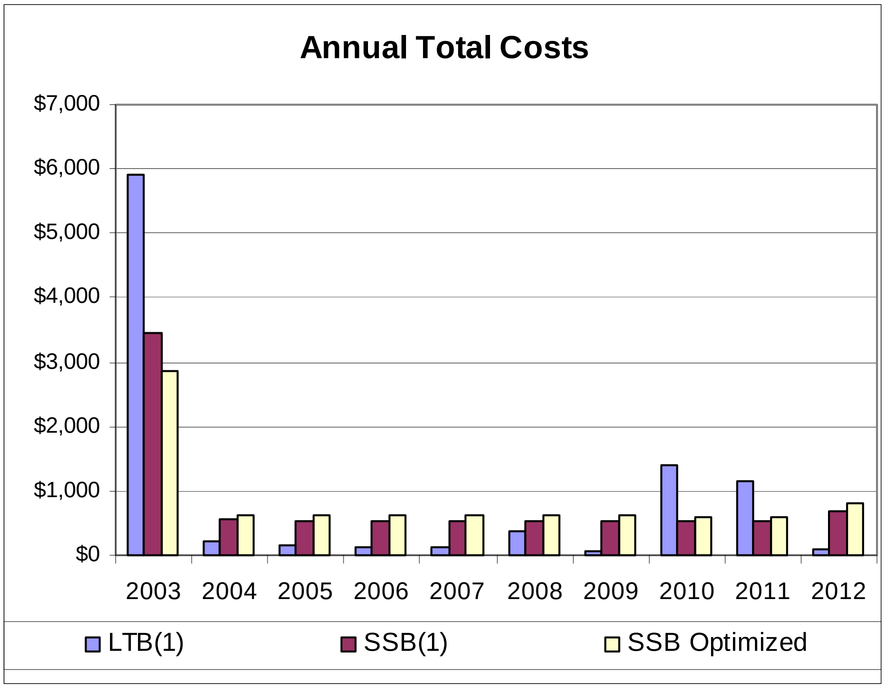


Chart 2: Annual Total Costs (LTB (1), SSB (1), SSB Optimized)

The funding profile for the LTB(1) approach not only has a greater total support cost, it also incurs the majority of this cost upfront with a very erratic funding profile for the remaining years. The next two charts emphasis these two facts.

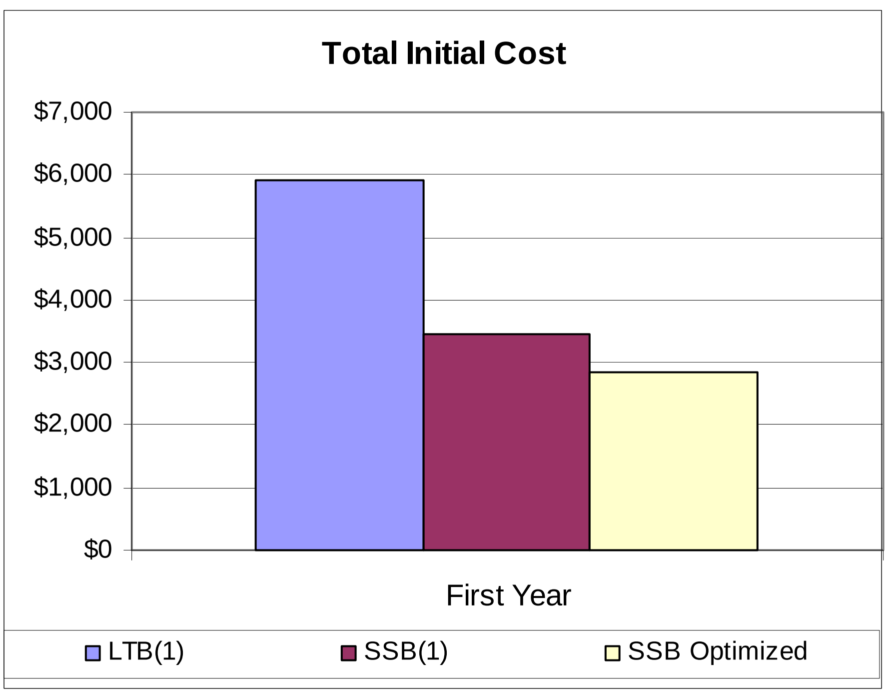


Chart 3: Total Initial Cost (LTB (1), SSB (1), SSB Optimized)

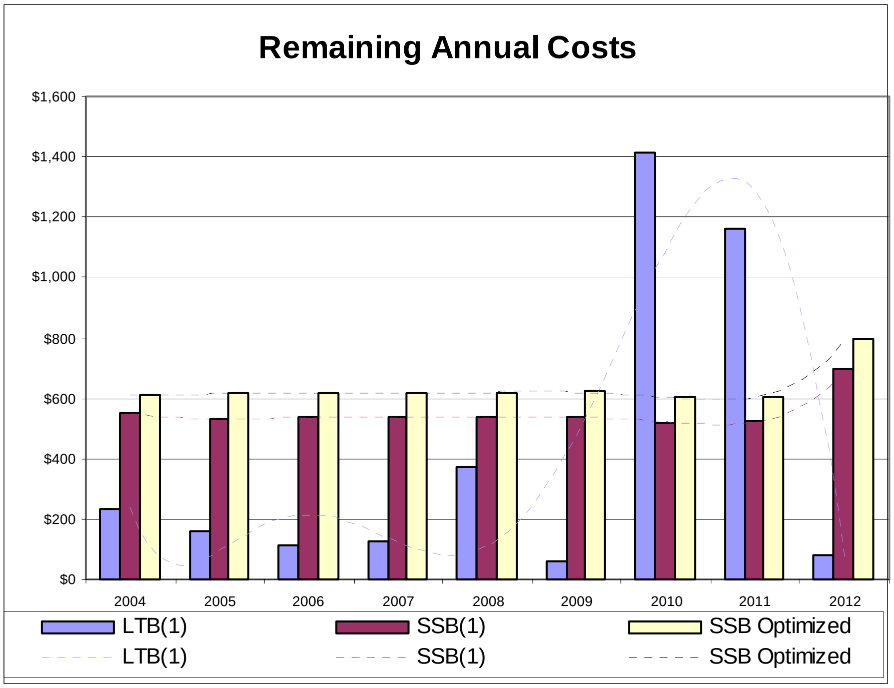


Chart 4: Remaining Annual Costs (LTB (1), SSB (1), SSB Optimized)

The LTB (1) approach is burden with more then half of the overall costs in the first year (see graph below) and has a more unstable funding profile in the remaining years. This instability affects the planning and budgeting process executed at the beginning of the period.

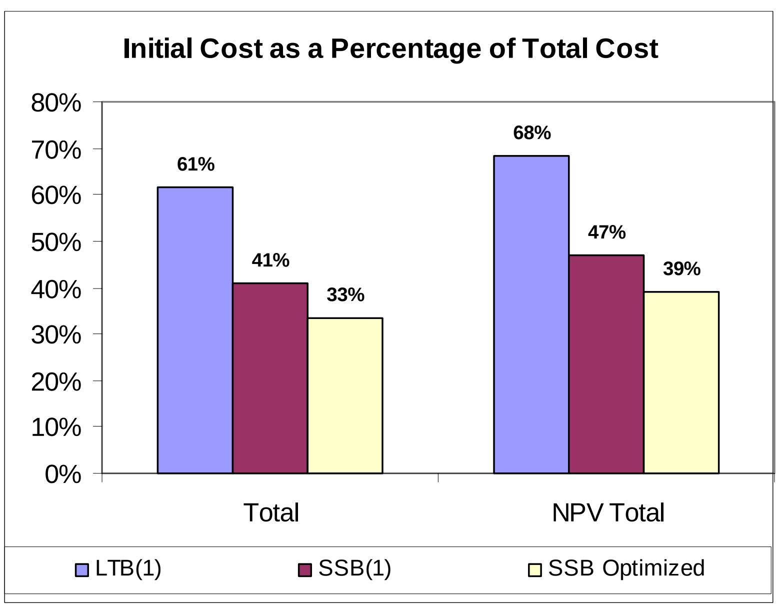


Chart 5: Initial Cost as a Percent of Total (LTB (1), SSB (1), SSB Optimized)

The total support cost consists of two major sources: 1) procurement of the hardware, and 2) the resources needed for managing the system configuration, engineering tasks, testing, documentation, ILS planning and management, and installation.

The following chart breaks down the total support cost into procurement and resources.

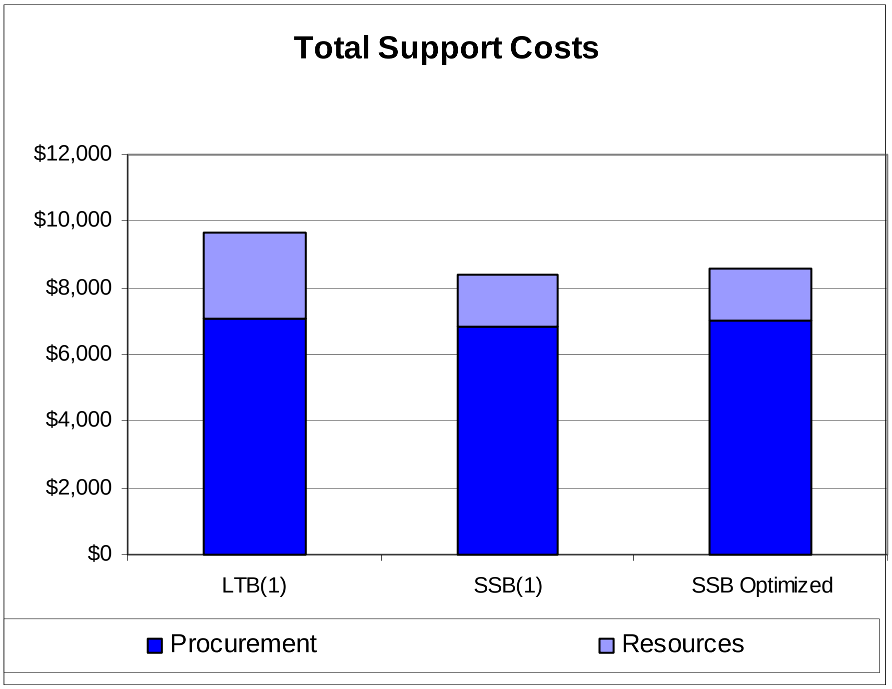


Chart 6: Total Support Costs (LTB (1), SSB (1), SSB Optimized)

From the above graph, we see that the procurement costs contributes significantly more than the resource costs.

Focusing on the procurement costs we get:

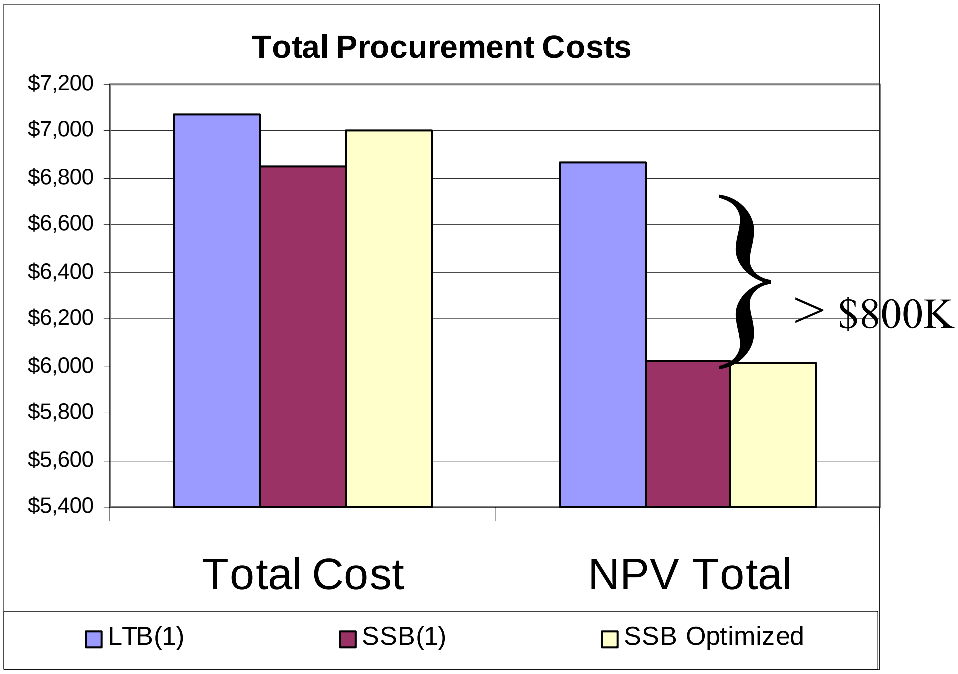


Chart 7: Total Procurement Cost (LTB (1), SSB (1), SSB Optimized)

Through further inspection we see that the procurement costs for the LTB(1) is also larger than for the SSB methods. Furthermore, the NPV values are significantly lower for the SSB methods. This leads us to conclude that the costs for these two approaches will be spread out over the ten-year period. In fact the following chart confirms this.

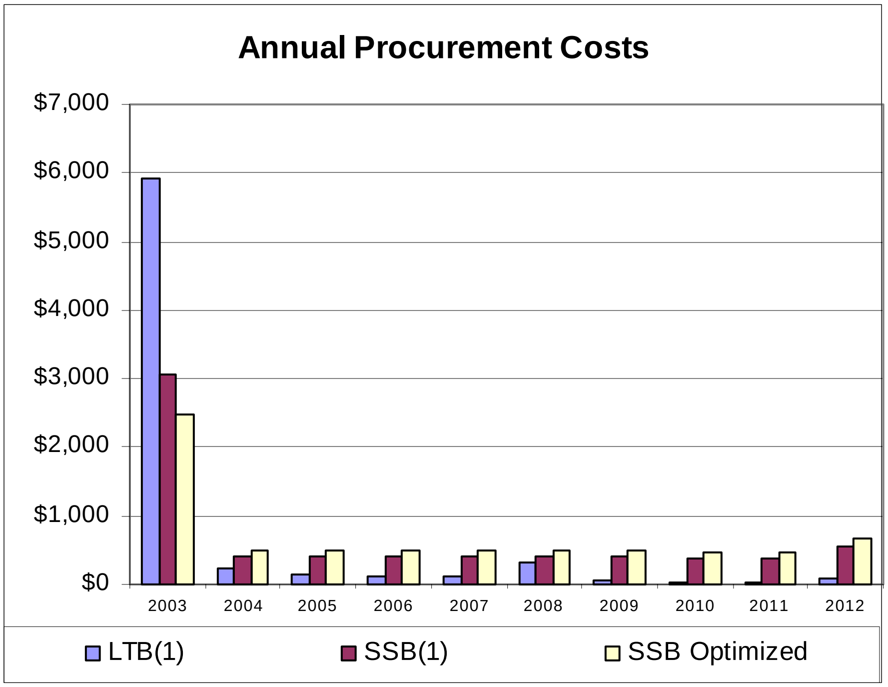


Chart 8: Annual Procurement Costs (LTB (1), SSB (1), SSB Optimized)

From the above chart, we see that the procurement costs for the LTB(1) are primarily incurred in the first year, typical for bridge buy scenarios. The SSB methods have lower initial costs and share the remaining costs with the remaining years. The next two graphs break out the initial costs and the remaining years.

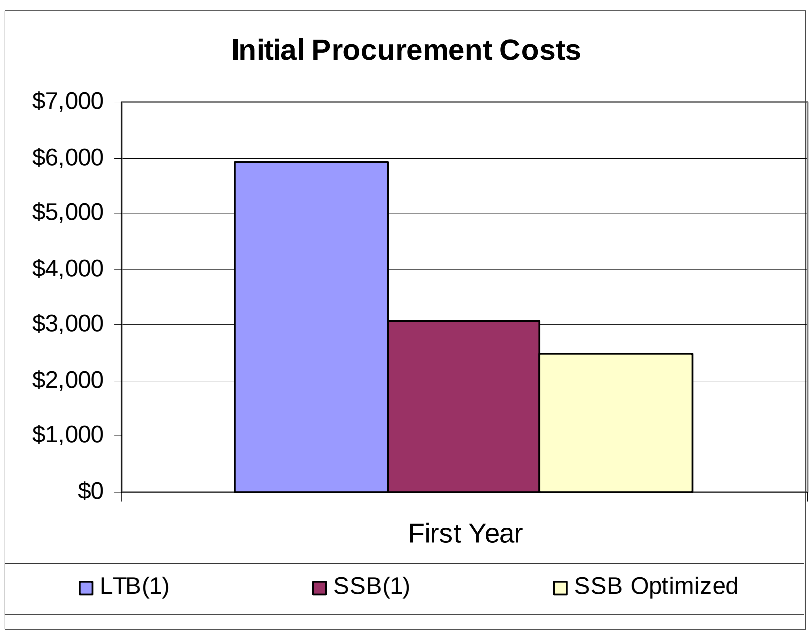


Chart 9: Initial Procurement Costs (LTB (1), SSB (1), SSB Optimized)

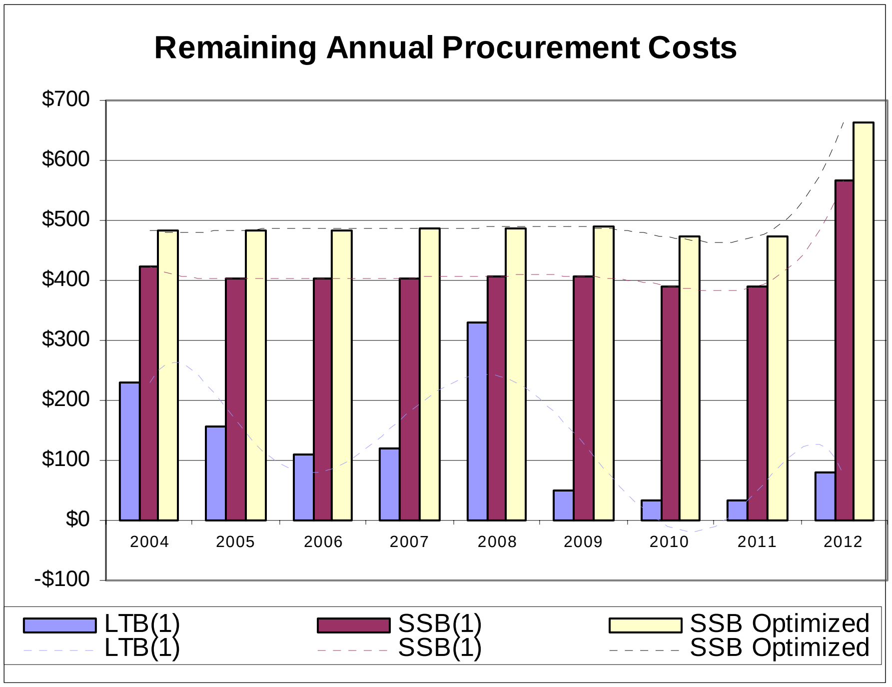


Chart 10: Remaining Initial Procurement Cost (LTB (1), SSB (1), SSB Optimized)

The important points to make here is that the SSB methods require less upfront costs, spreads the remaining costs out over the rest of the support period, and deliver a more stabilized funding profile for the remaining years as depicted by the trend lines in the above graph. The amount of the initial procurement costs invested in each scenario is illustrated below.

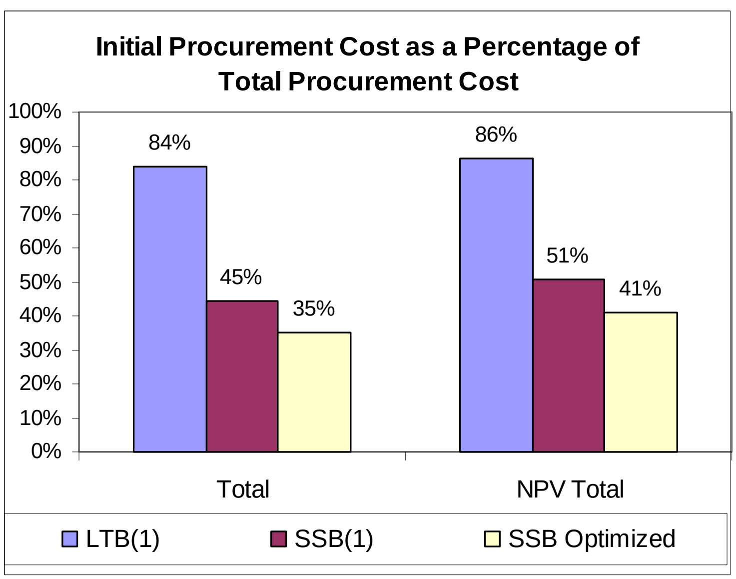


Chart 11: Initial Procurement Cost as a Percentage of Total Procurement Cost (LTB (1), SSB (1), SSB Optimized)

The above graph clearly shows the level of commitment needed to initiate a particular support method. For completeness, the procurement costs for the remaining years as a percentage of the total procurement costs is given below, again emphasizing the stability of the funding profiles for the SSB implementations.

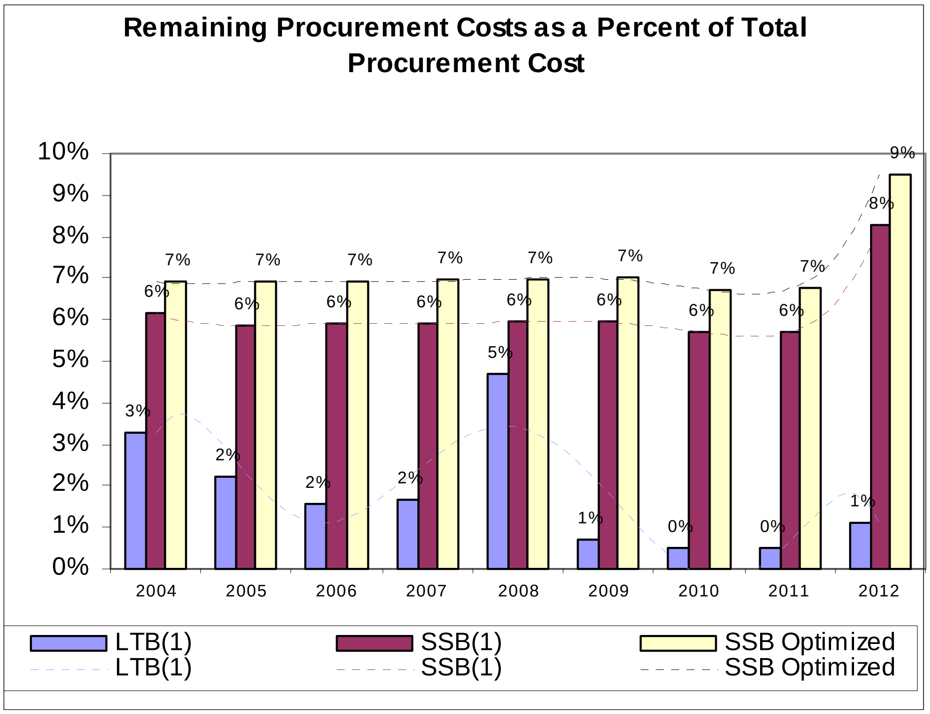


Chart 12: Remaining Procurement Costs as a Percentage of Total (LTB (1), SSB (1), SSB Optimized)

As earlier, for each scenario presented above an additional cost must be considered due to those items that are planned to undergo a redesign. The amount of $7.063M must be considered in presenting a complete picture of cost for each scenario.

WBS Element	Total ($K)
Total	**7063**
Configuration Management	**126**
Hardware/Software Engineering	**1684**
Testing And Documentation	**944**
Procurement	**3866**
ILS Planning and Management	**337**
Installation	**107**

Appendix C Table 7: Work Breakdown Structure Element

Part of this total cost is also procurement in the amount of $3.866M. These amounts are constant between all three scenarios and therefore excluded from the results in order to focus on the actual contributions of each support method. This redesign effort

is essentially a technical refresh task required for those COTS products that cannot or have been chosen not be supported by either the LTB or SSB mechanisms.

In order to avoid this technical refresh and its subsequent costs the PMO would have to employ the LTB or SSB methods from the beginning or consider a complete redesign of the entire SSDS. In this next section we will look at supporting the SSDS by three additional scenarios in order to avoid the technical refresh that would otherwise be required as mentioned above. These additional scenarios are:

1) LTB for all COTS products over the ten-year period.
2) SSB for all COTS products over the ten-year period.
3) A complete redesign of the system.

The following graphs will help depict the cost structure for each scenario. This first graph shows the total cost of implementing any of the three support methods.

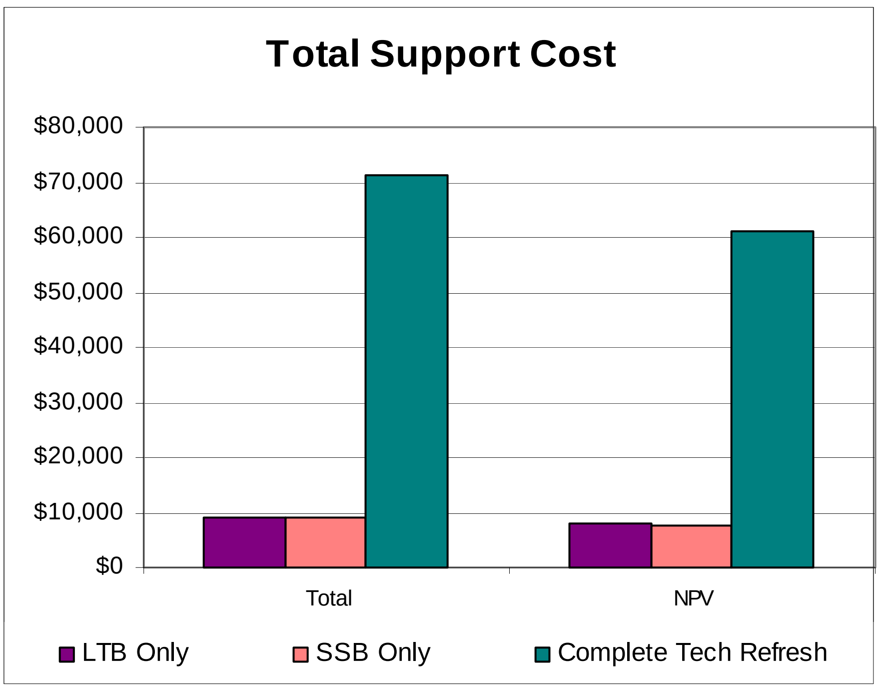


Chart 13: Total Support Cost (LTB Only, SSB Only, Complete Tech Refresh)

It's not hard to see that a complete redesign or technology refresh is by far the most expensive method. This is anticipated considering all of the elements that must be funded. The following chart shows the elements and their contribution to this particular effort.

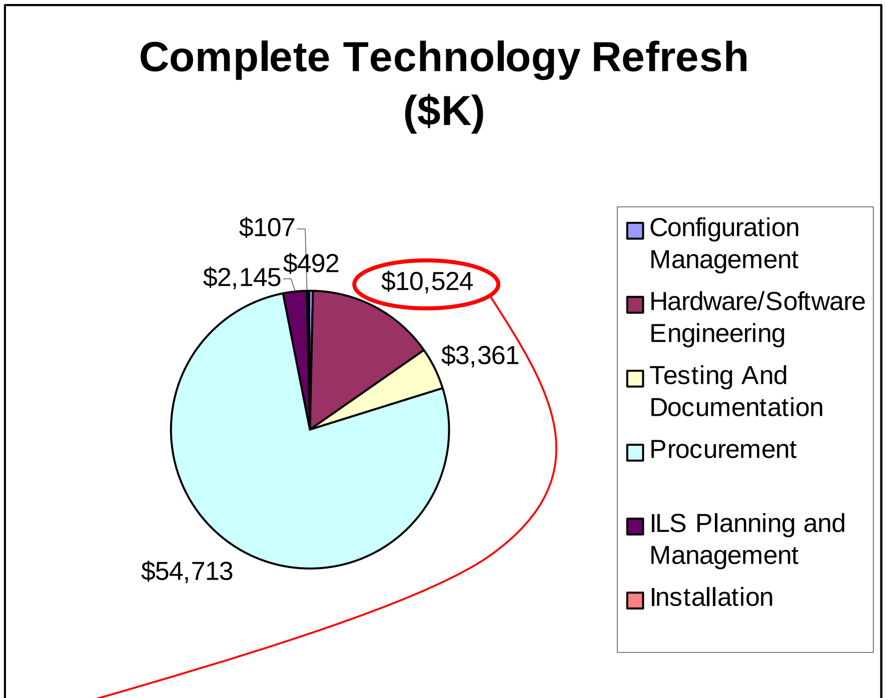


Chart 14: Complete Technology Refresh (Cost Allocation)

In addition to a huge procurement cost ($54.7M), notice the engineering costs at $10.5M. This amount is greater than the total cost of either of the other two methods.

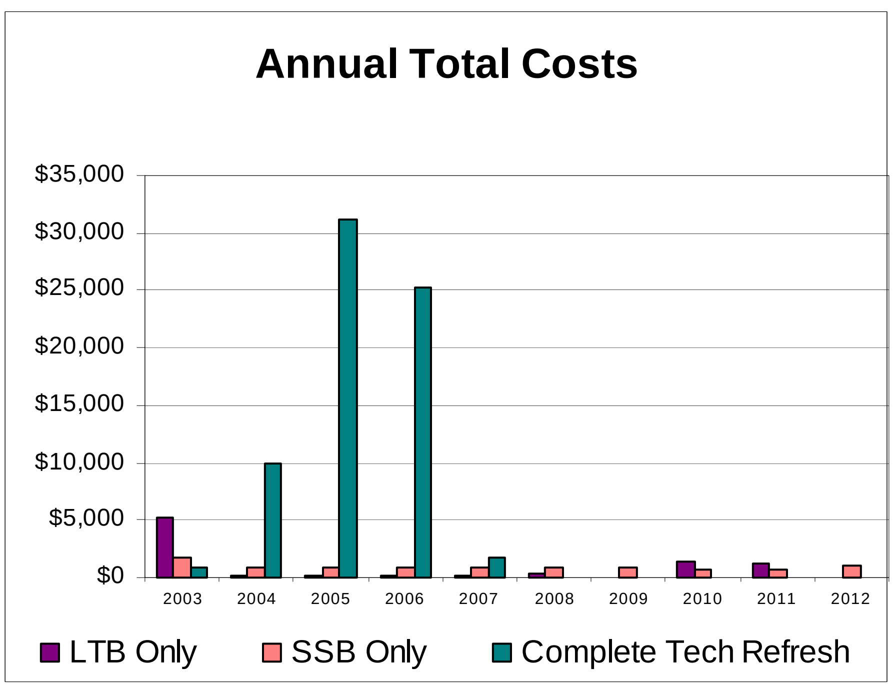


Chart 15: Annual Total Costs (LTB Only, SSB Only, Complete Tech Refresh)

The annual costs are shown above. The majority of the costs for a complete redesign occur in 2004, 2005 and 2006. These amounts are significant and are based on proper planning in year 2003. What this implies is that poor planning can cause these figures to increase; therefore a great deal of risk is assumed if this scenario were executed.

As with other scenarios, procurement costs make up the majority of the overall costs. The following graph illustrates the contributions of procurement and required resources to the total support costs.

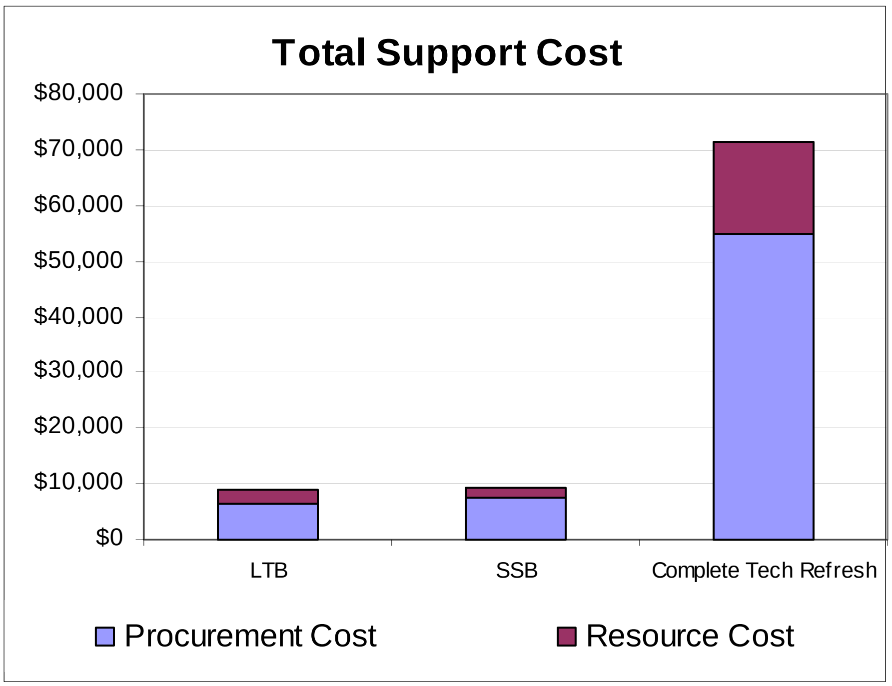


Chart 16: Total Support Cost (LTB Only, SSB Only, Complete Redesign)

In each case, procurement costs are the overriding contributor to overall costs and a complete technology refresh requires huge procurement dollars. This is easy to understand since this effort is outfitting the entire fleet where the other two scenarios are simply replacing anticipated failed COTS products. The next graph illustrates the procurement impact for each.

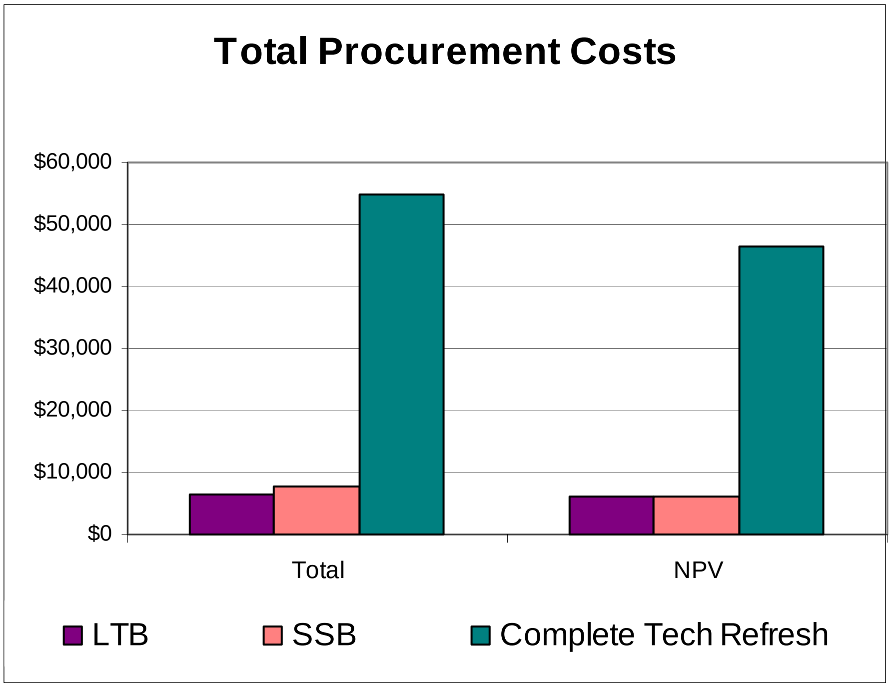


Chart 17: Total Procurement Costs (LTB Only, SSB Only, Complete Tech Refresh)

Needless, to say, a tremendous amount of investment in hardware is needed to support this scenario.

Furthermore this investment is made early in the ten-year period. This brings us back to a recurring theme, which is hardware procured early is likely to be obsolete by the time you reach the end of the ten-year period when it is to be installed. From the illustration in Chart 15, significant expense is incurred in the 2005 and 2006 timeframe for tech refresh. This is 3-5 years before we expect to install.

From this point forward we will exclude the Complete Technology Refresh scenario as a reasonable choice simply because of the large cost associated with it. In doing so we assume that the benefits derived from a complete tech refresh is not worth the costs, because when driven by COTS obsolescence cycles these refresh costs reoccur every 2-5 years unless supported with other support alternatives like SSB or LTB. We will now concentrate on the remaining two scenarios of LTB Only and SSB Only. In order to simplify the graphs, the LTB Only and SSB Only will be replaced by LTB and SSB respectively. The Total Support Costs for each are indeed comparable, as seen from the below graph.

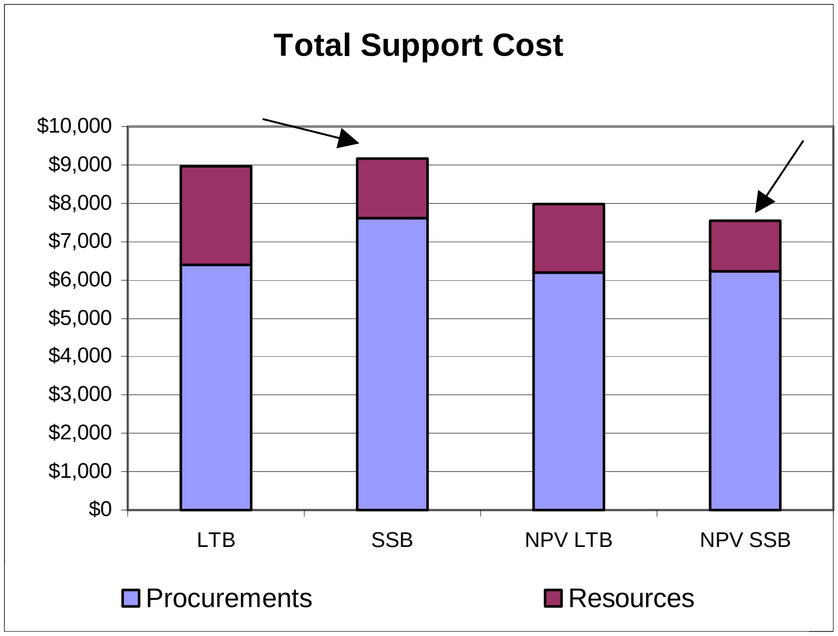


Chart 18: Total Support Cost (LTB, SSB, NPV LTB, NPV SSB)

At first glance, it looks like the SSB approach is slightly more expensive overall, but applying Net Present Value we see it actually costs less. The following graphs will help us to understand why this is so. Looking at the annual costs we see two familiar attributes of the SSB method:

1) Lower Initial Cost 2) Costs are spread out more evenly.

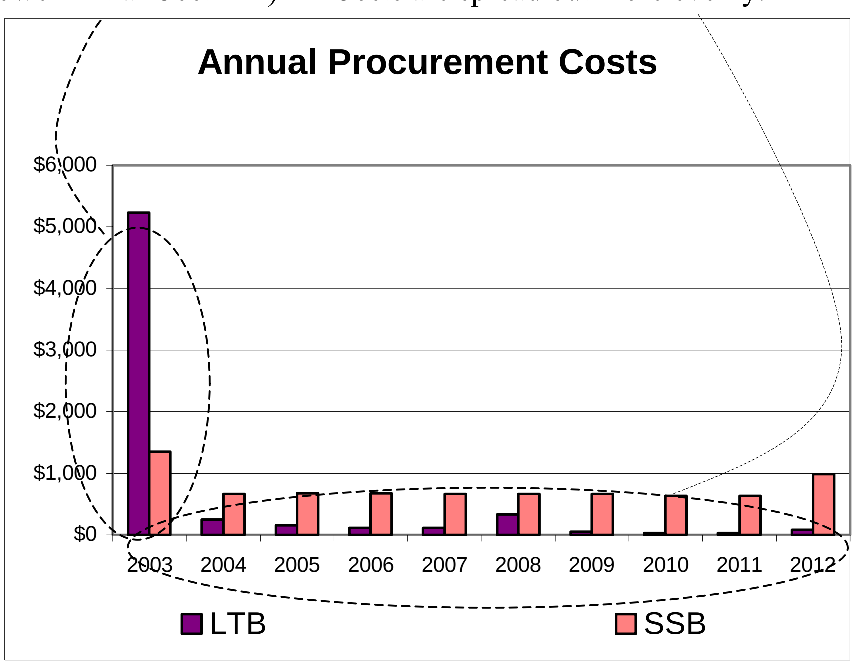


Chart 19: Annual Procurement Costs (LTB, SSB)

The next graph targets specifically the initial cost.

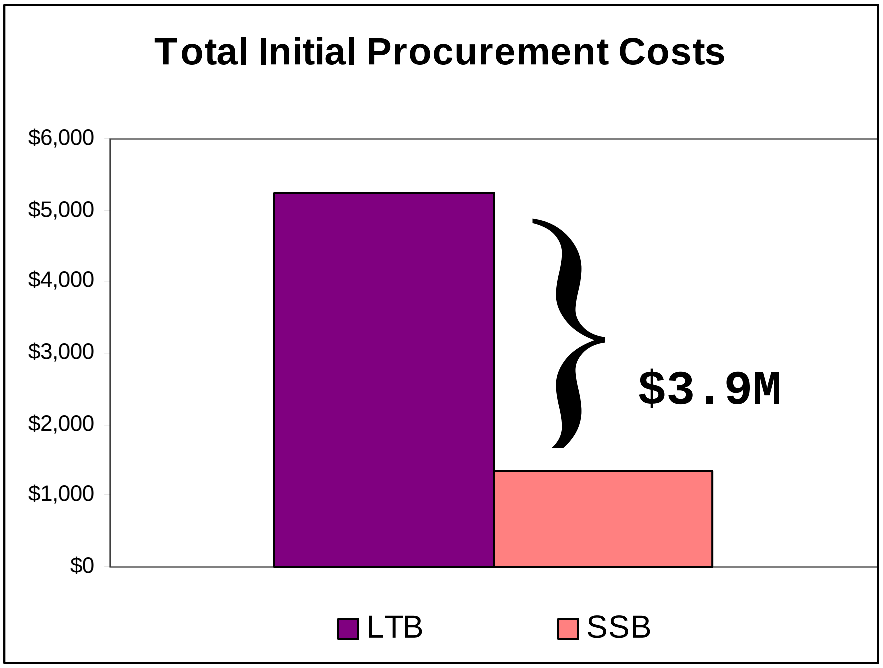


Chart 20: Total Initial Procurement Cost (LTB, SSB)

The LTB method must invest nearly $3.9M more in the first year than the SSB method.

In terms of overall costs the following provides the percent of total procurement cost that has to be invested in the first year (2003).

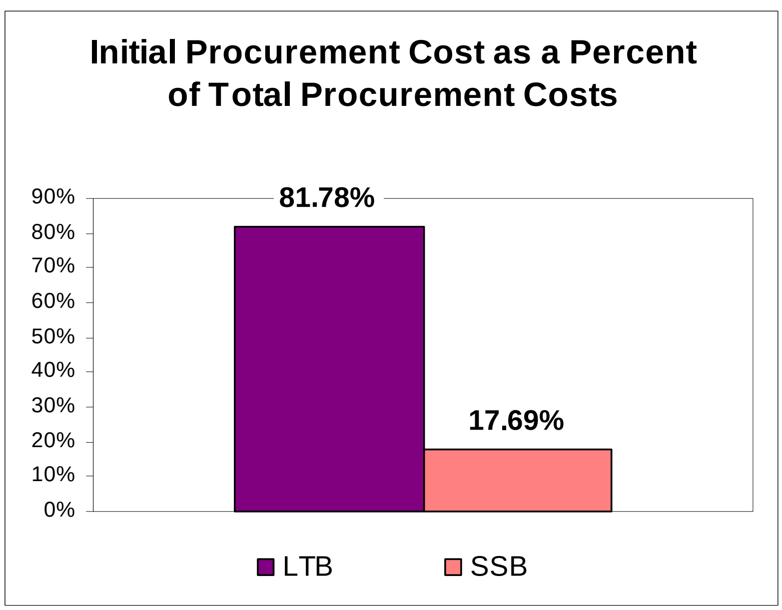


Chart 21: Initial Procurement Cost as a Percentage of Total Procurement Costs (LTB, SSB)

Nearly 82% of the total procurement costs for LTB are allocated in the first year. This introduces significant risk to the program. The number of COTS products procured is based on failure rate analysis data. This investment essentially locks the PM in for the duration of the ten-year period with little flexibility. Additionally, conservative failure rate estimates, that is high failure rates must be used in order to ensure the COTS items can be supported for the entire ten years. The SSB on the other hand invests less than 18%, which results in spreading out the costs over the out years. The following graph illustrates.

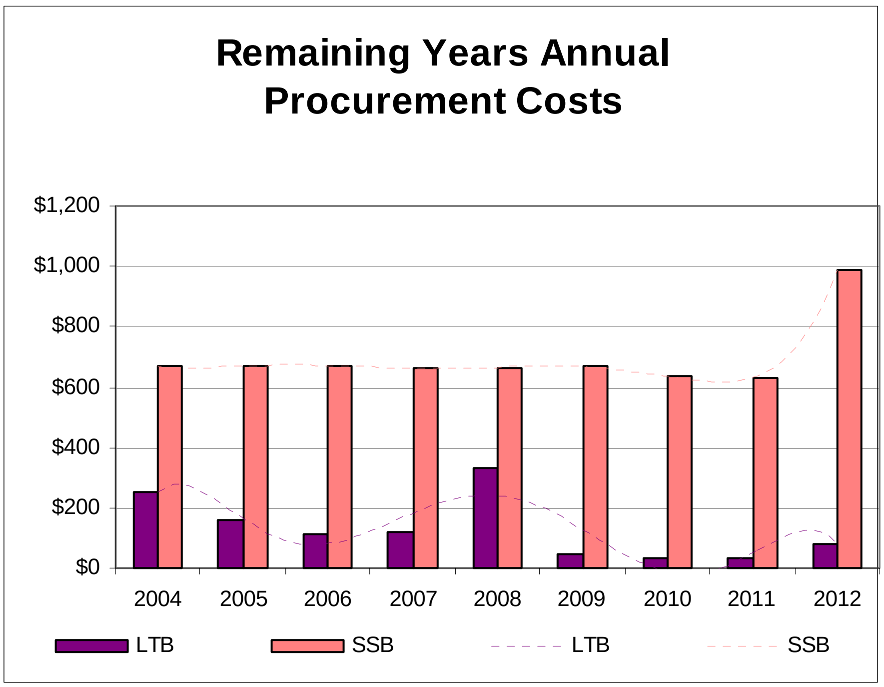


Chart 22: Remaining Years Annual Procurement Cost (LTB, SSB)

Less investment is needed up front, leading to larger expenditures in the later years. First of all, less up front expense results in lower risk and more flexibility. The flexibility comes from the fact that you have more of the total allocated dollars for the program not invested. Secondly, each subsequent year's costs are higher but with each passing year the risk associated with expenditures is lower as we approach the end of the ten-year period. Also, procurement costs are associated with actual failures for that year. In this case study, we had to predict the actual failures based on MTBF and MRDB data. In reality, under the SSB method, procurement costs would only be incurred when a COTS product fails. Under the LTB method we are procuring COTS products in

advance of their failure. If they don't fail, we've bought an item for no reason. Finally, the SSB method has a much more stable funding profile. This has significant impacts to improving the planning and budgeting aspects of the program.

One final thought is to compare all six scenarios. Given the tremendous cost associated with a complete technology refresh, we will exclude this alternative in the following two graphs. This allows us to focus on the five remaining support scenarios. In this way we can see what can be gained by initiating a particular support strategy early in the acquisition cycle.

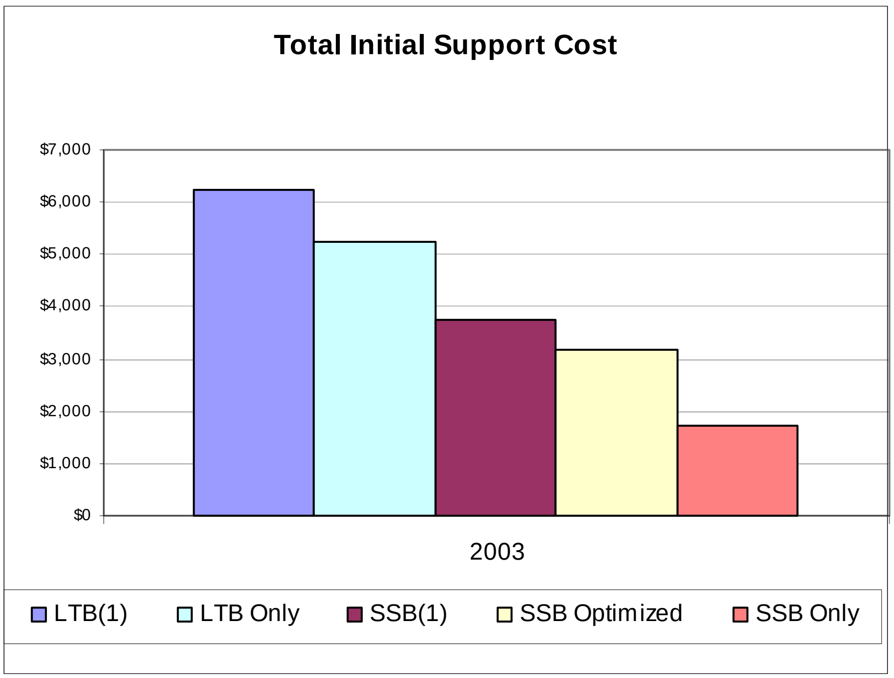


Chart 23: Total Initial Support Cost (LTB(1), LTB Only, SSB(1), SSB Optimized, SSB Only)

From this we can see that the greater degrees to which we implement the SSB process the lower the initial investment. The lower initial investment translates into lower risk. So in effect, implementing the SSB System acts a risk mitigation tool. Considering the following cost profiles further emphasizes this.

The following graph shows the annual support costs for the remaining years out to 2012. The trend lines show the stability in funding over this period.

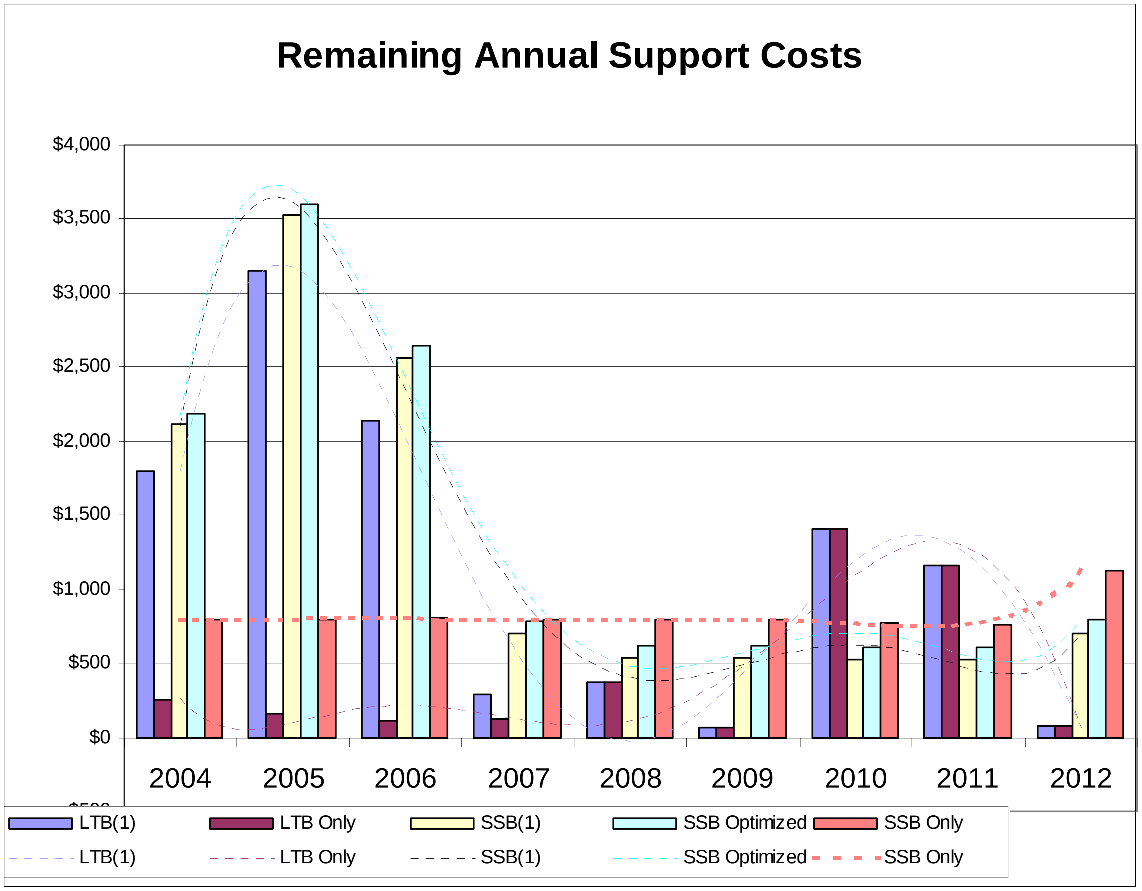


Chart 24: Remaining Annual Support Costs (LTB(1), LTB Only, SSB(1), SSB Optimized, SSB Only)

Of all the scenarios, only the '*SSB Only*' scenario exhibits a stable funding profile. Recall for the '*SSB(1)*' and '*SSB Optimized*' scenarios, we had to include the cost for a partial tech refresh for those nine identified COTS products. This additional cost skews the stability for these two scenarios. Of course, after the first few years (2003-2006) their funding profiles become more consistent from one year to the next.

D. ANALYSIS OF RESULTS

In this section we derive usable, decision-making information from the results of the previous section. The results will be summarized and evaluated for their contribution to the business objectives. This section will address both financial metrics as well as non-financial implications.

1. Direct Financial Impacts

The financial aspects are summarized below for the four scenarios we defined in the previous section.

Scenario	First Year Costs	Total All Years	NPV Total All Years	Consumed Inventory	NPV Adjusted Total
LTB(1)	$5,924	$9,639	$8,651	$701	$9,352
SSB(1)	$3,440	$8,415	$7,333	$701	$8,034
SSB Optimized	$2,858	$8,665	$7,321	$701	$8,022
LTB Only	$5,234	$8,970	$7,981	$0	$7,981
				$0	$7,539

Appendix C Table 8: Total Support Costs

The above table demonstrates the potential savings in the first year as well as the overall costs to support the SSDS program over the defined ten-year period. These values are taken directly from the cost models in Enclosure 30.

1) When the SSB process was implemented, regardless of degree, significant savings were realized. See column *NPV Adjusted Total* in the above table.
2) When the SSB process was implemented, the initial year costs were reduced indirectly proportional to the degree of SSB implementation. See column *First Year Costs* in the above table.

Scenario	First Year Costs	Total All Years	NPV Total All Years	Consumed Inventory	NPV Adjusted Total
LTB(1)	$5,924	$7,069	$6,871	$701	$7,571
SSB(1)	$3,059	$6,854	$6,025	$701	$6,726
SSB Optimized	$2,477	$7,004	$6,012	$701	$6,712
LTB Only	$5,234	$6,400	$6,201	$0	$6,201
					$6,231

Appendix C Table 9: Procurement Costs

The above table demonstrates the potential procurement savings in the first year as well as the overall costs to support the SSDS program over the defined ten-year period. These values are taken directly from the cost models in Enclosure 30.

1) When the SSB process was implemented, regardless of degree, significant savings were realized. See column *NPV Adjusted Total* in the above table. The figure for SSB Only is slightly larger than for LTB Only. The reason for this is because the SSB process requires a cost to purchase Red Parts each year, the first year being $534,011 and a total for all years of $828,426. The LTB methods make the assumption that they can purchase all the required items upfront for usage throughout the ten-year period and that all item will be consumed. There is risk involved with buying too many or not enough items.
2) When the SSB process was implemented, the initial year costs were reduced indirectly proportional to the degree of SSB implementation. See column *First Year Costs* in the above table.

When we perform standard deviation calculations over the ten-year period we get the following.

STD DEV	LTB(1)	LTB Only			
All Years	1836	1617	836	627	231
	100	102	55	61	111
	105	108	10	7	16

Appendix C Table 10: Standard Deviation Procurement Costs

1) When the SSB process is implemented, we experience a more stabilized funding profile for procurement, particularly for the middle eight years. See the above table.

When we look at the standard deviation for the total support costs for each scenario we get the following. Remember, for the LTB(1) and SSB(1) scenarios we had to take into account a redesign effort for nine COTS items. This cost is incurred early in the ten-year period and affects the overall stability of the funding profile.

STD DEV	LTB(1)	LTB Only	SSB(1)	SSB Optimized	SSB Only
2003-2012 All Years	1896	1597	1322	1208	303
2004-2012 Excludes Initial Year	1068	508	1135	1131	111
2004-2011 Middle years	1056	526	1188	1186	16

Appendix C Table 11: Standard Deviation Total Support Costs

1) When SSB is implemented early enough we can effectively avoid any redesign costs that would be needed due to obsolescence during the ten-year period and therefore expect the greatest stability in the funding profile over the ten-year period.

The percentage of overall initial costs associated with each scenario is given below.

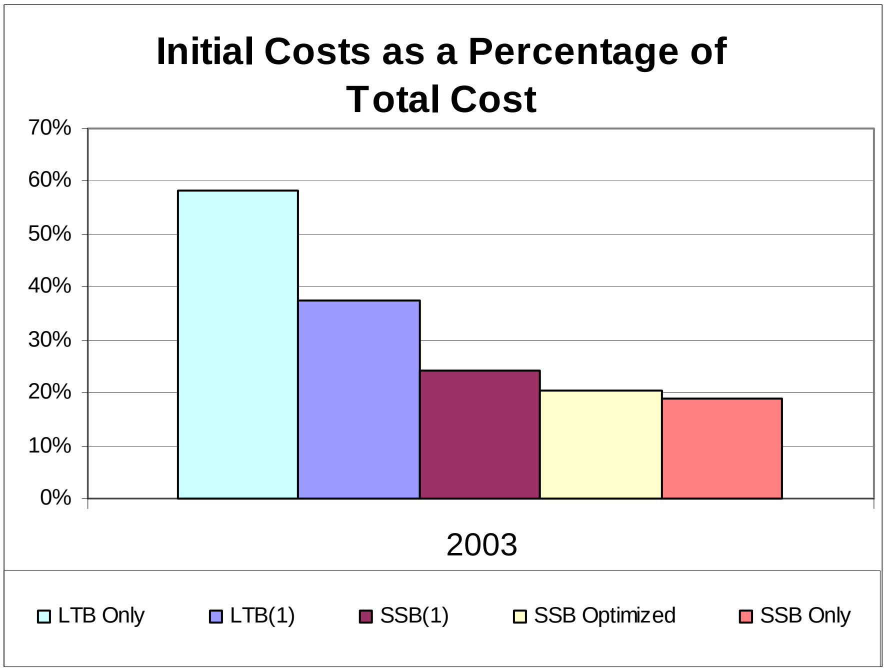


Chart 25: Initial Costs as a Percentage of Total Cost (LTB(1), LTB Only, SSB(1), SSB Optimized, SSB Only)

1) When the SSB process was implemented, the initial cost as a percentage of the total cost to the program was significantly reduced depending on the degree of implementation. This helps to reduce the risks associated with making large upfront investments as the costs are more evenly distributed over the entire ten years.
2) When the SSB process was implemented, the costs are more evenly distributed over the ten-year period depending on the degree of implementation. This is more desirable for planning and budgetary purposes.

The following table provides the costs associated with having to redesign those COTS products that were targeted for redesign prior to SSB implementation. These items were determined to become obsolete prior to 2003, and unsupportable via traditional support mechanisms.

WBS Element	Total ($K)
Total	**7063**
Configuration Management	**126**
Hardware/Software Engineering	**1684**
Testing And Documentation	**944**
Procurement	**3866**
ILS Planning and Management	**337**
Installation	**107**

Appendix C Table 12: Total Support Costs Required for Tech Refresh

1) The total cost that could have been potentially avoided if the SSB process had been implemented for those identified COTS products is approximately $7.063M.

This $7.063M cost is considered the potential Avoided Costs when implementing the SSB process during SSDS design. The optimal SSB implementation point being the earliest point in the system engineering process.

The following summaries show the savings for procurement, resources and the total support costs between the two most practical scenarios (LTB(1) and SSB(1).

LTB(1) Procurement Cost (Typical scenario)	$6871
SSB(1) Procurement Cost (Actual SSB Implementation)	$6025
Procurement Savings	**$ 846**
LTB(1) Resource Cost	$1780
SSB(1) Resource Cost	$1308
Cost Savings	**$ 472**
LTB(1) Total Support Cost	$8651
SSB(1) Total Support Cost	$7333
Cost Savings	**$1318**

Appendix C Table 13: Total Support Cost Savings: SSB(1) versus LTB(1)

1) When the SSB process was implemented significant cost savings is realized.

The following data illustrates the potential savings of the current typical support scenario of LTB and a required tech refresh of nine items and SSB for all COTS products upfront. The units are in K dollars.

LTB(1)	**$8651**
SSB Only	**$7539**
Potential Cost Savings	**$1112**
Cost Tech Refresh of 9 Items	**$7063**
Cost to SSB the 9 Items	**$669**
Avoided Cost Savings	**$6394**
Total Potential Cost + Avoided Cost	**$7506**

Appendix C Table 14: Total Savings: Potential Cost + Avoided Cost

1) If SSB was implemented for all COTS products early enough we can essentially avoid the cost associated with a required partial tech refresh.

The final summary of data looks at the extreme cases. The following illustrates the savings between implementing SSB early in the acquisition cycle to affect all COTS products and redesigning all COTS products.

Complete Tech Refresh	**$61089**
SSB Only	**$ 7539**
Procurement Savings	**$53550**

Appendix C Table 15: Savings: SSB Only versus Complete Tech Refresh

In looking at the SSB portion of the first year procurement costs for each scenario we get the following table.

Support Method	Non SSB Costs	SSB Costs	SSB% of Total Costs
LTB(1)	$5,924	$ 0	0.0%
LTB Only	$5,234	$ 0	0.0%
SSB(1)	$2,097	$ 962	31.4%
SSB Optimized	$1,321	$1,156	46.7%
SSB Only	$ 103	$1,243	92.3%

Table 13: SSB Portion of Total Support Cost

1) For all but the '*SSB' Only* scenario four, the majority of the initial procurement costs are associated with non-SSB support mechanisms.
2) The greater degree of SSB implementation the lower the initial investment and thus lower program risk.

In comparing the resource models for the traditional and actual implementations we notice similar orders of magnitude for total costs.

WBS Element	Actual ($K)	Traditional ($K)
Total	**8415**	**9639**
Configuration Management	0	57
Hardware/Software Engineering	0	0
Testing and Documentation	0	0
Procurement	10	7069
ILS Planning and Management	0	2354
Installation		158
Sunset Supply Costs	**8404**	-

Appendix C Table 16: Support Cost Comparison: SSB(1) – Actual versus LTB(1) Traditional

The SSB infrastructure absorbs nearly all the costs for supporting COTS products over the ten-year period.

1) The actual scenario provides infrastructure to support the SSDS program, resulting in greater flexibility and manageability for the PM.
2) Implementation of the SSB infrastructure is possible at the same or lower cost to the program as traditional methods.

5. NON-FINANCIAL IMPACTS

Certain non-financial impacts materialize based in part on financial consequences. In order to successfully evaluate the results of implementing the SSB process we must look at these non-financial aspects in light of the business objectives. But first we must clearly derive such impacts. Since no clear financial metric can be applied to these impacts we will discuss them in broad terms and in ways that can be observed and verified. The approach here will declare a financial outcome or business practice of implementing the SSB infrastructure, and explain in non-financial terms the tangible impact.

a. Low Initial Expense

By reducing the upfront costs for procuring expected spares, the SSB process brings improved flexibility to planning and budgeting. If the initial costs are large then the PMO is forced to stay the course for the entire period in order to derive the maximum return on investment. Changing program direction during the ten-year period would be difficult to argue given the number of spare COTS products that would become potentially useless. Under the SSB infrastructure much of the initial costs are still associated with non-SSB support mechanisms; therefore, these costs will be absorbed in

the event the program did not make use of the assets that were procured. In the *All SSB* scenario, nearly all, about 92%, of the upfront costs are for SSB support. The benefits associated with this cost are immediately realized, that is the procured COTS items are deployed to the fleet for use upon purchase. Furthermore, in the event that performance requirements change, driving a change in system design, the risks are greatly reduced if less of an investment was made for spares that may not be needed. So therefore the SSB process effectively reduces the risk of overspending early in the support cycle.

Derived Benefits:

- Cost Savings
- Flexibility
- Reduced risk
- Stability

b. Stable Funding Profile

The SSB process spreads the procurement costs more evenly throughout the ten-year period. This makes efficient use of funds and is easier to budget and manage. The yearly costs are higher under the SSB, but that's because no investment in spares was made the first year. Nevertheless, as before, the costs associated with these years are for forecasted replacements on an as need basis. The costs are incurred at the moment a requisition is made for a replacement COTS item. The benefit is immediately realized. Furthermore, by procuring COTS replacement products only on demand the PM makes better use of funds. Also, continual market surveillance is practiced throughout the support cycle providing real-time data in terms of obsolescence and diminishing materials. In this way the PM is better equipped to make effective decisions that benefit the overall program. This environment creates a flexible process that by taking a proactive posture can react to changes in material availability.

Derived Benefits:

- Stability
- Efficient use of funds
- Flexibility
- Risk Mitigation

c. The Sunset Supplier Shares Risk

One area of cost savings not addressed was the cost to the Navy for stockage, storage and issue of COTS spares and repair parts. These are costs not directly borne by the SSDS program. But in addition to the cost savings to the Navy for not having to house, manage and transport these COTS items, the Sunset Supplier now assumes the responsibility, and thus risk, of facilitating these functions and recoup the value added by adjusting the product purchase price by 5% on each COTS item procured.

Derived Benefits:

- Risk Mitigation & Management
- Shared Risk
- Shared responsibility
- Collaborative Environment

d. Extending COTS Supportability

Recall the costs derived due to COTS products that were supported by OTHER. The resource model, Enclosure 30 (*Resource_Cost_Model*, worksheet Partial Tech Refresh), demonstrated the costs associated with having to redesign before the end of the support cycle. This figure was $7.063M. The point here is that by implementing the SSB process early enough in the program, we can effectively extend supportability for these items. And in fact we can extend the reparability of these items by identifying and procuring near-obsolete components (Red Parts). In this particular case, by the time the SSB infrastructure was in place, it was too late and subsequently cost the program an additional 7 million dollars. The planning for redesign carries certain risks as well. The DoD will almost certainly use COTS products for the commercial technology advantages touched on earlier in this document. And they will work towards specific warfighter performance requirements. For the COTS products identified in Enclosure 30, the items were determined to be obsolete by 2005-6 timeframe. Now remember that there is a 2-3 year planning period and additional 3-5 year implementation period for new designs. If the period of concern starts in 2003, the COTS products could become unsupportable before the planning phase even ends. By implementing the SSB process we effectively avoid this situation by extending supportability of the COTS products so that warfighter

requirements can continue to be met while plans are made to upgrade the system. By stabilizing the system baseline this way we mitigate the risks of not being able to support the warfighter to acceptable levels.

Derived Benefits:

- Extending COTS Supportability
- Extend COTS Reparability
- Cost Savings/Cost Avoidance
- Stabilize System Baseline
- Risk Mitigation & Management

e. Initial Investment

Recall that the initial cost for setting up the SSB infrastructure and making the initial COTS product assessments was approximately $380K (taken from Enclosure (30)). This is a minor investment considering that the realizable return is substantial depending on how early in the acquisition cycle SSB is implemented. For example, the cost of support for the present SSDS before SSB was considered was estimated to be $8651K plus an additional partial tech refresh cost of $6394K (total of $15045). The estimated cost of implementing SSB early enough to affect all COTS products was $7539K. The potential savings is roughly $7.5M. That, in itself, is a wonderful marketing element, however there is also another point to made; and that is that this setup and assessment can be performed for any program. Thus, the SSB process is transportable and repeatable. And as the proliferation of COTS products increases throughout the military, there is a strong likelihood that commonality of COTS products across weapon systems will grow. Having a SSB process that maintains and continually updates a database of these COTS products for usage, obsolescence, and diminishing materials will provide a tremendous benefit whose value will grow exponentially. Thus, the SSB process is also expandable. This initial investment is made within the DoD, tasking Navy resources to perform supportability assessments and DMSMS/Obsolescence Management. The reports generated become government property and distributed among the DoD PMOs as well as commercial support entities (Sunset Supplier). Therefore other programs can leverage the data and the relationships

from the SSB infrastructure. This initial investment is also used to fund the government facilitating activity for pursuing and coordinating potential OEM and Sunset Suppliers.

Derived Benefits:

- Transportable, repeatable and expandable.
- DMSMS/Obsolescence reporting
- Collaborative Environment
- Coordination

6. SUMMARY OF FINANCIAL AND NON-FINANCIAL BENEFITS

Summary of Benefits	
Financial	**Non-Financial**
• Reduced Procurement Cost • Lower Upfront Costs • Significant Cost Avoidance • Stabilized Funding Profile • Overall Cost Savings to the Program	• Flexibility – Planning & Budgeting • Reduced risk • Stability –Funding Profile • Efficient use of funds • Risk Mitigation & Management • Shared Risk • Shared Responsibility • Collaborative Environment • Extending COTS Supportability • Extend COTS Reparability • Stabilize System Baseline • Transportable, repeatable and expandable. • DMSMS/Obsolescence reporting • Coordination

Appendix C Table 17: Summary of Benefits

7. ALIGNMENT WITH SSB SPECIFIC GOALS

SSB Specific Goal	Derived Benefit
Achieve significant and quantifiable cost savings over the product life cycle.	• Reduced Procurement Cost • Lower Upfront Costs • Significant Cost Avoidance • Stabilized Funding Profile • Overall LC Cost Savings to the Program

SSB Specific Goal	Derived Benefit
To be able to identify, quantify, and mitigate supportability risk to programs.	• DMSMS/Obsolescence reporting • Reduced risk • Risk Mitigation & Management • Shared Risk
Extend the life cycle and supportability of COTS.	• Extending COTS Supportability • Extending COTS Reparability
Provide infrastructure to support existing platform/combat systems in support of the PMO.	• Transportable, repeatable and expandable. • Coordination • Collaborative Environment *By virtue of SSB implementation and the benefits documented within this section, an infrastructure is obviously in place to support existing weapon systems.*
A reliable, affordable, repeatable, and expandable process that meets the customer's performance expectations (e.g., accessible, transportable, maintainable, predictable).	• DMSMS/Obsolescence reporting • Transportable, repeatable and expandable. • Stabilize System Baseline
Institutionalize methods for proactive management of COTS including DMSMS issues.	• DMSMS/Obsolescence reporting • Collaborative Environment
A system that leverages Navy and commercial supportability assets and provides a networked solution.	• Collaborative Environment • Shared Responsibility • Shared Risk • Coordination
Leverage across government programs with extended applicability through contract strategies, methodologies, and incentives to entice commercial industry participation.	• Flexibility – Planning & Budgeting • Transportable, repeatable and expandable • Collaborative Environment
Forecast budget requirements in support of the programs/war fighter/consumer	• Flexibility – Planning & Budgeting • Efficient use of funds • DMSMS/Obsolescence reporting
Improve schedule flexibility and support options of system upgrades or new development initiatives.	• Flexibility – Planning & Budgeting • Extending COTS Supportability

SSB Specific Goal	Derived Benefit
	• Stabilize System Baseline

Appendix C Table 18: Alignment of Benefits with SSB Specific Goals

8. CONTRIBUTIONS TO BUSINESS OBJECTIVES

a. Financial and Business Performance

The implementation of the SSB process to the SSDS program has had positive impacts to both the financial and business performance requirements. The SSB process essentially provides an architecture that specifically addresses the issue of obsolescence, diminishing manufacturing sources, and material shortages. In this way the risk to the program is significantly reduced. The architecture provides effective coordination and networking leading to tremendous cost savings as well as the ability to ensure long-term supportability for COTS products. From a financial perspective, the SSB process allows for the opportunity to significantly reduce the upfront costs and stabilize the funding profile over the period of support leading to a much more efficient use of funds. This is in addition to sizeable cost savings and avoidance. From a business perspective, the overall awareness of obsolescence and material shortages gives the PM more information for making effective decisions. Furthermore, the risk mitigation aspects of the SSB process come from establishing a collaborative environment where the responsibilities and risks are shared between the commercial and government activities. Out of this environment come positive business impacts in terms supportability, program planning, program risk and life cycle cost management.

b. Strategic Positioning and Ownership

The SSB infrastructure was implemented into the SSDS program. The overall environment is one of collaboration, coordination and trust. The functions are coordinated across a network of commercial and government activities. The expertise from both the private and public sectors is shared across this network. This situation nurtures long-term relationships between the commercial entities and the DoD. These relationships are consistent with present DoD and industry partnering initiatives. This and the fact that the SSB process has provided tremendous cost savings to the SSDS program only strengthens the strategic position of the SSB concept within the set of

support alternative solutions presently available to the PMO. Furthermore, the mere fact that the PMO has discretion and authority to create an SSB environment illustrates the control and ownership the PMO has in face of COTS product proliferation. Remember, the COTS initiative essentially reduces the control the DoD has historically had over system design and support. The SSB process allows the PMO to regain some control in that it extends supportability and maintains key technologies for stabilizing the system baseline.

c. Operations and Functions

Reviewing the benefits that are derived by implementing the SSB process, we immediately realize the positive effect it has on extending COTS product supportability for the SSDS program. Recall, that commercial product life cycles are typically 18-months to 2-years, whereas DoD planning and implementation easily exceeds 5 years. In this case the SSB process allowed the PMO to postpone likely redesigns that result from obsolescence. By extending supportability, the SSB processes gives the PMO the opportunity to better forecast and react to changes in warfighter requirements as well as in the market. Overall management of the program is made more efficient given the extended timeframe for assessing technology trends and evolving warfighter requirements. By extending COTS product supportability, the PMO can now align technology refresh cycles with product end-of-production dates. In this case we are talking about the extended production of a specific COTS product by the Sunset Supplier. At the same time we can essentially compress the timeframe for delivering support to the warfighter. Sunset Suppliers take on the responsibility of stockage, storage, and issue of COTS replacement and repair parts. Improved delivery to the warfighter is expected since the Sunset Supplier is contractually responsible for specific performance metrics.

d. Product and Services

With the implementation of the SSB process, key enabling technologies are retained through extended supportability over a defined period of time. The net result is a stabilized system performance baseline with an overall improvement in terms of product and service. The SSB process allowed the PM to match the COTS product update cycles with the program’s technical roadmap or refresh effort. Furthermore, as a product, the SSB infrastructure becomes part of a toolset that provides obsolescence indicators and

reports as well as the ability to mitigate maintenance and supportability issues at the assembly level. This support strategy can now include a mechanism for establishing and managing the information obtained from the assessment and reporting activities, thus empowering the PM with the knowledge necessary to deliver an improved customer service. In the long run the system integrity is maintained, which has several implications in terms of integrated logistical support (i.e. training, manuals, configuration control, etc..)

e. Image

The financial and non-financial benefits derived and identified within this document prove the viability, effectiveness and value of the SSB concept as alternative to conventional support mechanisms. Not necessarily as a replacement for these traditional methods but as another option. The SSB process does not intend to extend supportability for the sake of retaining old technology, but rather to stabilize the system performance baseline for periods that can be aligned with typical DoD acquisition cycles. It offers an opportunity for the PMO to consider redesigns based on performance enhancements in response to evolving warfighter requirements rather than redesigns due to obsolescence. This mere fact makes this an attractive scenario from a PM's perspective for improving life cycle management. And in conjunction with the significant cost savings the overall appeal of the SSB concept should make it the alternative of choice for PMs seeking to optimize their support strategy.

XII. CONCLUSION

A. SUMMARY

The overall acquisition of military weapon systems is a challenging endeavor to say the least. One thing that has been reported, and confirmed in this business case analysis, is that procurement costs make up more than half of the acquisition costs. In fact, the procurement costs incurred after a system has been fielded still accounts for the majority of the life cycle costs. This scenario has lead DoD to begin leveraging commercial standards, products and practices in an attempt to lower risk and life cycle costs. The use of COTS products has made great strides to reducing life cycle cost while transferring state-of-the-art technologies to the warfighter. However, these gains have come with their own set of problems. Given the mission criticality and software-intensive architectures of present weapon systems, slight changes in COTS products are simply unacceptable. Minor changes to a piece of COTS hardware can have serious implications to readiness and program costs, given their software intensive nature. It typically takes a significant effort, in terms of time and money, to develop, test and deploy upgraded changes. To further, complicate the issue, these weapon systems are developed and deployed in small quantities making them unattractive for typical commercial business interest. The uniqueness of these systems makes them difficult to support affordably. And given that commercial technology refresh cycles are around 18-24 months where the DoD can barely hope to refresh every 5-7 years, there is little incentive for major equipment manufacturers to continue production of a product that no longer fulfills their business objectives just for the sake of accommodating the military, which makes up less than 0.4% of the market. There is really only one of two ways to handle this dilemma. Either accelerate the acquisition phase, which is highly unlikely given the conservative DoD acquisition approach, or extend the supportability of the COTS products. Additionally, as the commercial content within military systems increase, the issue of COTS product supportability is complicated by orders of magnitude. Consider for a moment the eventual increase in technology refreshes needed across the DoD/Navy program spectrum as a result of the tremendous proliferation of COTS in military applications. This increase makes the issue of COTS supportability a

major concern during acquisition and support strategy development. For program planning and budgeting purposes a mechanism is needed to effectively assess the COTS product supportability position for a particular program. To this end, the SSB concept provides a support recommendation process for each COTS product in the weapon system under analysis. This approach assists the Program Manager (PM) in making decisions that will impact life cycle costs of the weapon system while meeting technical design requirements. And from a planning and budgeting perspective it provides higher confidence in future program cost predictions. The output of the SSB process helps PMs map proposed technology updates to system deployment, operation and support plans.

B. INTERPRETATION OF RESULTS

The results presented in of this document clearly illustrate that the SSB implementation has the potential to offer significant cost savings to the SSDS MKI program in terms of total support. The savings come from many areas depending on the present state of the program. For the SSDS program certain COTS products have already been slated for specific support methods. These include redesign, reclamation, spares utilization, maintenance contracts and bridge buys. For those items designated as a candidate for bridge buys, the SCWG considered implementing the SSB process as a support solution alternative. Cost models were generated for comparison purposes in order to fully understand the impacts. Three main scenarios considered to be the most practical, were analyzed in terms of resource and procurement costs. In an effort to fully evaluate the SSB implementation three additional scenarios were generated. These scenarios are impractical at this stage in the SSDS program but could be viable alternatives given the right circumstances such as early in the acquisition cycle. Nevertheless, the results not only reflect an overall cost savings for the ten-year analysis period, they also provided further insight to other desirable benefits. In particular, risk mitigation and management was enhanced for the PM. The SSB method had an extremely low initial investment as well as a profoundly stable funding profile over the ten-year period. The low initial cost translated into less of upfront buy-in. The more money that is invested upfront, the more you are locked into a situation in order to derive the greatest return on those initial investments. For example, let us say that you purchase a million dollars worth of spares in the first year in an effort to support a particular

product over ten years. After the first two years you use up $200K of the spares when you are presented with an opportunity to improve product support, reduce costs and/or enhance system capabilities. You still have $800K invested in spares. In this case you are unlikely to take advantage of this opportunity. Subsequently, low initial cost reduces the risk of staying the course and fully optimizing program attributes. Furthermore, in the situation where you have made significant investment in spares upfront, you are calculating this amount based on a forecast of failures for a particular item. There are two risks associated with this. First, investing too much means making purchases in spares that will never be used. Secondly, buying too little, runs the risk of not being able to support the weapon system for the prescribed period of support. Along with the low initial costs, the SSB method allows for even expenditures of the remaining funds. To whatever degree the SSB was implemented, the resulting funding profile was very stable. This stability is important to the planning and budgeting process. Effective planning and budgeting is essentially a process in risk mitigation, and anything we can do to help the planning and budgeting process helps us to reduce risk. Also, remember the very nature of the SSB infrastructure is a collaborative venture in which responsibility and thus risk is shared between the commercial and government entities, a further step in risk reduction. Furthermore, by stabilizing the funding profile we can make efficient use of funds, which is a recurring mandate throughout government acquisition directives. The effects of SSB implementation have clear financial impacts, which are aligned with Federal and DoD initiatives, regulations and guidelines.

The financial aspects of SSB implementation are not enough to conclude it as a viable support solution alternative. Just because we can save money, we have to ensure that it meets the requirements of the program and ultimately the warfighter as well. The SSB process extends the supportability and reparability of COTS products. By establishing arrangements between Navy Field Activities/Resources, the OEMs and third party small businesses (Sunset Suppliers), we can provide insurance to the Program Management Office (PMO) that a particular COTS product will be sustained for a defined period of time. In fact, delivery of the replacement spare is initiated at the time of failure in the fleet. The COTS item is purchased on demand rather than upfront, which is based on failure rate data. If ten items fail over ten years, you will only purchase ten

replacement items. This approach again is flexible and provides a mechanism for improving the planning and budgeting for the next tech refresh point. The extension of support stabilizes the system baseline so that a more focused approach is given to planning for future product or system redesign efforts. By stabilizing the system baseline for a defined period of time, we again reduce risk to COTS obsolescence during this period. In fact, the very SSB infrastructure facilitates effective obsolescence and material shortage assessment and reporting. This assessment capability is a coordinated effort across the SSB infrastructure. As the SSB is implemented on more programs membership in the SSB process grows allowing greater access to programs Navy-wide. In effect, the data collected in one program is likely valuable to other programs given the growing proliferation of COTS products in military applications. Therefore we visualize a process that is transportable, repeatable and expandable for all DoD/Navy programs.

C. IMPACT TO ACQUISITION STRATEGY

This Business Case Analysis has demonstrated that the SSB infrastructure is an affordable approach for mitigating program supportability risk. The collaborative nature of the SSB process leverages the various areas of high performance and ability residing in the government, big business and the small businesses. The risks are quantifiable and shared across the infrastructure. The SSB process was conceived for and therefore sensitive to the supportability of fielded COTS products as defined by the warfighter. As an acquisition strategy it extends the life cycle and supportability of COTS and ensures late-life cycle supply support. The SSB process essentially permits the DoD to be successful in leveraging commercial developments with appropriate economies of scale in order to reach its military performance goals while offsetting the problem of DMSMS.

The SSB infrastructure directly supports existing combat/weapon systems. In this way it provides the PMO an additional support solution alternative. This alternative can be implemented early in the acquisition process to demonstrate the value and viability of COTS product usage. The SSB process can also provide insight to the supportability of selected COTS products early enough in the acquisition process to significantly reduce program risk related to COTS and life cycle management. Additionally, when applied to various DoD/Navy programs, component commonality could lead to a flexible, integrated logistical support approach. This scenario would likely have a ripple effect that

incentivizes the commercial industry to develop long-term relationships with the respective PMOs.

The essence of the SSB process lies in its ability to detect potential supportability problems. And by extending the supportability, it provides sufficient time for analysis of alternatives and solutions in the decision-making processes. Furthermore, accurate assessment of COTS supportability can be accomplished at any level (subsystem, equipment, component, or piece part). This approach not only extends supportability but reparability as well. The SSB approach is to procure assemblies when the customer requires them. To this end, the SSB process is committed to continual assessment over the entire COTS product life cycle. Again, this approach breeds a more informed decision-making process translating to improved support performance and lower life cycle costs.

Overall, the SSB process becomes an additional and likely the preferred support solution alternative for PMs who will welcome the schedule flexibility provided by the SSB process. The flexibility comes from the fact that the SSB infrastructure can tailor the support options in terms of functions and expectations demanded by the warfighter. These functions include immediate supportability and fast, reliable and direct delivery to the warfighter. The COTS product supportability assessments are critical to effective SSB implementation and therefore a great deal of emphasis is placed on the collection, maintenance and dissemination of the information and knowledge derived. In this way the SSB process is definable and repeatable. In the end, the SSB provides the PM with an independent utility for implementing COTS products and has minimal or no impact on system operational performance. Once implemented, the SSB is an affordable, expandable, repeatable and reliable process that will meet the users performance expectations. It provides the best of both worlds. It leverages the inherently governmental functions of the Navy supply process and coordinates with commercial supportability assets through a thoroughly meshed and maintainable communication network solution.

D. RECOMMENDATION

DoD has recognized that product support solutions can be more effectively designed and implemented if the acquisition and logistics communities work in partnership. Within the SSB infrastructure integrated acquisition and logistics functions conduct supportability analysis as an integral element of the systems engineering process. This process (SSB) should occur at the beginning of program initiation to ensure designed in reliability and maintainability throughout the program life cycle. This will also ensure that the system performance baseline remains unchanged therefore continuing to meet the warfighter's supportability requirements. Although applicable at any phase of the acquisition cycle, it is critical to consider the SSB implementation in the earliest possible stage to gain maximum benefit. Consider the *SSB Only* support scenario. This scenario essentially employs the SSB method for all COTS products. The *SSB Only* method illustrates a situation where SSB was implemented prior to other support method choices and subsequent commitments. In this case we saw the greatest stability in the funding profile and the lowest initial investment amount. Together they result in the lowest risk to the program while providing more flexibility and sustainment capability.

The SSB process should be a continuous process. COTS product supportability assessments should be repeated frequently throughout the acquisition cycle. This approach not only keeps the data stored on COTS products fresh, but also allows for some maturation of the process. The plan is to effect a Continuous Measurable Improvement environment that will ensure that the most cost-effective methods of support are being considered and subsequently offered to the PM.

The PM is expected per DoDD 5000 to use the most effective source of support that optimizes performance and life cycle cost, consistent with military and statutory requirements. The source of support may be Organic or commercial, but its primary focus is to optimize customer support, achieve maximum weapon system availability at the lowest Total Ownership Cost. At their disposal, the PM has a set of support methods that can be used to achieve this objective, the SSB process, as proven in this BCA to be a viable and effective support method, should be included as an additional support solution alternative in this set.

LIST OF REFERENCES

1) Glum, Ted (2000). Support for the Warfighter. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/
2) Robinson, David G. (2000). DSCC DMSMS Management. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/ .
3) McDermott, John T. (2002). "Reducing the Impact of Obsolescence in Military Systems." In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm
4) Hartshorn, W.T. (2000). "Obsolescence Management Process as a Best Practice." In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/ .
5) OSD (2001)"Public-Private Partnering for Depot Level Maintenance", Office of the Secretary of Defense, July 2001. Retrieved on [June 2002] http://www.jdmag.wpafb.af.mil/2001%20partnering%20report.pdf
6) OSD (2002) Office of the Secretary of Defense "DAU Program Managers Toolkit", Eleventh Edition, Version, 1.1, April 2002, p.40
7) Augustine, N. (1994). "America's high noon complex." Army RD&A Bulletin. September-October 1994
8) GAO (1996) Appendix 1 of the GAO Executive Guide, Effectively Implementing the Government Performance and Results Act (GPRA). The GAO report number is GGD-96-118, and was issued in June, 1996 Located at the Center for Information Technology through the National Institute of Health website. Retrieved on [June 2002] http://wwwoirm.nih.gov/itmra/gprasum.html
9) Clinger-Cohen (1996) Information Technology Management Reform Act of 1996 (Division E of Public Law 104-106). It became effective August 8, 1996. Also known as the Clinger-Cohen Act. Retrieved on [June 2002]. http://wwwoirm.nih.gov/itmra/itmra96.html
10) OMB (2000) Office of Management and Budget, the Executive Office of the President, Circular No. A-130. Retrieved on [June 2002] http://www.whitehouse.gov/omb/circulars/a130/a130trans4.html
11) DUSDL (1999) "Business Case Model for the DoD Logistics Community: A Guide to Business Case Development," Deputy Under Secretary of Defense (Logistics), Logistics Reinvention Office, March 1, 1999
12) DoD (2000) Department of Defense Directive 5000.1, "The Defense Acquisition System" October 23, 2000
13) DAU (2002) Defense Acquisition University Deskbook. Viewed on [June 2002] http://deskbook.dau.mil/jsp/default.jsp

14) NAVAIR (1997) NAVAIR's Contracting for Supportability Guide (Section 5.2, p.5-3)
15) DUSD (1999) Office of the Deputy Under Secretary of Defense Report "Product Support for the 21st Century" July 1999. Retrieved on [June 2002] http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/lpp/assetts/product_support/report%20for%2021st%20century.pdf
16) DoD (1996) U.S. Department of Defense, The Joint Staff, "Joint Vision 2010, Focused Logistics - A Logistics Roadmap," 1996, p.24
17) DoD (2000) U.S. Department of Defense, The Joint Staff, "Joint Vision 2010," 1996 and Joint Vision 2020," May 24, 2000 http://www.dtic.mil/jv2020/jvpub2.htm
18) McIlvaine, Paul J. (1999)."The Evolution of 21st Century Acquisition and Logistics Reform", p330, Joint Aviation Logistics Board Report on Commercial Support of Aviation Systems; June 1999.
19) DoD (1997) Department of Defense. "Report of the Quadrennial Defense Review" May 1997
20) DoD (2001) Department of Defense. Interim Regulation, DoD 5000.2R, 2001, page 2-10
21) DoD (2001) Department of Defense. DoD 5000.2R, 2001, p.5-11
22) Carney – Oberndorf (2002) Carney, David J., Oberndorf, Patricia A.. "Commandments of COTS: In Search of the Promised Land, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA 15213. January 2002. http://deskbook.dau.mil/valhtml/2/25/253/253W05.htm
23) DoD (1999) The Department of Defense, Joint Aeronautical Commanders Group (JACG) Flexible Sustainment Guide, Revision July 1999.
24) NAVICP (2000) Naval Inventory Control Point Fact Sheet (2000), "Performance Based Logistics and Performance Based Logistics Business Case Analysis (BCA)." Retrieved on [June 2002]. http://www.navicp.navy.mil/03/036/0361/basicinfo.htm
25) JALB (1999) Joint Aviation Logistics Board. June 1999 report on "Commercial Support of Aviation Systems"
26) Joint Aeronautical Commanders' Group, 1999
27) FAR (2002) The Office of Federal Procurement Policy. AcqNet website for Federal Acquisition Regulations. Subpart 12.2. Retrieved on [June 2002] http://www.arnet.gov/far/farqueryframe.html
28) DoD (2001) Department of Defense. Defense Systems Management College (DSMC) Risk Management Guide for DoD Acquisition; (Fourth Edition); February 2001. Retrieved on [June 2002] http://web.deskbook.osd.mil/reflib/DDoD/001EC/005/001EC005DOC.HTM
29) USHR (2002) United States House of Representatives. United States Code, Title 10. Maintained by the Office of the Law Revision Counsel. Retrieved on [June 2002] http://uscode.house.gov/download.htm
30) Raytheon (2002) Raytheon Corporation, Products website: SSDS. Retrieved on [June 2002] http://www.raytheon.com/products/ssds/ and John Hopkins University, Applied Physics Laboratory, Programs, Air Defense Systems, Ship

Self Defense website. Retrieved on [June 2002]
http://www.jhuapl.edu/programs/airdefense/ShipSD2.htm
31) NSWC/Crane (2002) NAVSEA Naval Surface Warfare Center, Crane Division, Crane IN http://www.crane.navy.mil/
32) OMB (1992) Office of Management and Budget, the Executive Office of the President, Circular No.-94. October 29, 1992 Retrieved on [June 2002] http://www.whitehouse.gov/omb/circulars/a094/a094.html

APPENDIX D: SUNSET SUPPLY BASE MARKETING PLAN

THESIS TITLE **THE SUNSET SUPPLY BASE: LONG TERM COTS SUPPORTABILITY, IMPLEMENTING AFFORDABLE METHODS AND PROCESSES** by Michael E. Barkenhagen Michael W. Murphy March 2003 Thesis Advisors: Dr. John Osmundson Dr. Laurie Anderson Dr. Doug Moses

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ABSTRACT

This Marketing Plan is one of the four foundational documents created to establish the Sunset Supply Base (SSB) system as a Commercial off the Shelf (COTS) supportability alternative for Navy fielded systems containing COTS products. The plan analyzes the environments (external, internal, customer) in which the marketing functions will be operating in. The SSB system is evaluated for its attributes, both positives and negatives through a "SWOT" (Strengths, Weaknesses, Opportunities, Threats) analysis. Each of these characteristics is then matched to a marketing strategy to improve the system's marketability. Two goals are set: A) capture 20% of market share (72 Navy programs or 80 man-yr per year effort), B) Establish an Image for the SSB system as the alternative of choice for COTS supportability that enables cost effective Technology Insertion in fielded Navy systems. Based on a defined Target Market, a Marketing Mix is defined that identifies a series of marketing actions to achieve a competitive advantage for the SSB system in maximizing market penetration. This Marketing Plan is an integral part of overall System Engineering approach used to develop the SSB system whereby the implementation of this plan is contained within the system implementation process.

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LIST OF ACRONYMS AND ABBREVIATIONS

17 Steps	SSB System Implementation Process
2 yr/board	Two years per board, reflects necessary design and development time.
$	Low life cycle cost
$$	Mid Range life cycle cost
$$$$	Most expesive life cycle cost
$K	Cost represented in thousands of dollars
AIDA	Attention, interest, desire, action – marketing action model
AN/ASQ-20X	Designator for Sonar Mine Detecting Set developed for the Navy under the program management code PMS-210
AR	Acquisition Reform
ASN	Assistant to the Secretary of the Navy
BCA	Business Case Analysis
BOM	Bill of Material
CAGE	Contractor and Government Entity, manufacturers unique identifier number.
CLS	Contractor Logistic Support
CM	Configuration Management
CMM	Coordinate Measurement Machine
CMSE	Commercialization of Military and Space Electronics Conference
COTS	Commercial Off the Shelf
DAU	Defense Acquisition University
DEMS	Defense Reutilization and Marketing Service
DMEA	Defense Microelectronics Activity
DMS	Diminishing Manufacturers Supply
DMSMS	Diminishing Manufacturing Sources and Material Shortages
DoD	Department of Defense
E&MD	Engineering and Manufacturing Development Phase
ECP	Engineering Change Proposal
F3I	Form, Fit, Functional replacement
FAR	Funding Allocation Review
FY	Fiscal Year
GIA	Government Industry Association
GIDEP	Government Industry Data Exchange Program
Govt.	Government
H	High Risk
ICP	Inventory Control Point
IEEE 1722	Capability Assessment Tool
ILS	Integrated Logistics Support
IPT	Integrated Product Team
ISEA	In-Service Engineering Agent

ITIMP	Integrated Technical Item Management and Procurement System
Ktr	Contractor
L	Low Risk
LCC	Life Cycle Cost
LT	Long term supportability – greater than ten years
LTB	Life of Type Buy (also referred to as LOT Buy)
LSA	Logistics Support Analysis
M	Medium Risk
MAN-YR	Level of effort for one person over one year
MIL-Spec	Military Specifications
MIN/MAX	minimum/maximum
MKI	SSDS Mark I System
MKII	SSDS Mark II System
MOU	Memorandum of Understanding
MSP-Plus	PBL-MSP with MIN/MAX stocking requirements
MT	Mid Term supportability – five to seven years
MVP	Most valuable performer
NAVAIR	Naval Air Systems Command
NAVICP	Naval Inventory Control Point
NAVSEA	Naval Sea Systems Command
NDIA	National Defense Industrial Association
NRFI	Not ready for issue
NSWC/Corona	Naval Surface Warfare Center, Corona Division
NSWC/Crane	Naval Surface Warfare Center, Crane Division
OEM	Original Equipment Manufacturer
OFPP	Office of Federal Procurement Policy
OJT	On the job training
OMB	Office of Management and Budget
# programs	Number of program
PBC	Performance Based Contracting
PBL	Performance Based Logistics
PBL-O	Performance Based Logistics Organic
PBL-C	Performance Based Logistics Contractor
PBL-MSP	Performance Based Logistics – Mini Stock Point
PBL-P	Performance Based Logistics Partnership
"Full"-PBL	Performance Based Logistics – Contractor exercises full control
PEO	Program Executive Offices
PHS&T	Packaging, Handling, Storage and Transportation
PM	Program Manager
PMO	Program Management Office
POC	Point of Contact
POM	Program Objective Memorandum
PPBS	Programming, Planning and Budgeting System
R&D	Research and Development

ROI	Return on Investment
ROM	Rough order of magnitude
SECNAV	Secretary of the Navy
SEDI	Systems Engineering Development and Implementation Plan
SOW	Statement of Work
SPAWAR	Space and Naval Warfare Systems Command
SSB	Sunset Supply Base
SSDS	The Ship Self Defense System developed for the Navy under the program management code PMS-461
ST	Short Term supportability – less than five years
SYSCOM	Systems Command Structure
SWOT	Strengths, Weaknesses, Opportunities, and Threats Analysis
TOC	Total Ownership Cost

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I. EXECUTIVE SUMMARY

This Marketing Plan is one of the four foundational documents created to establish the SSB system as a Commercial off the Shelf (COTS) supportability alternative for Navy fielded systems containing COTS products. The SSB concept is a unique After-Market approach to extend the supportability of COTS products predicated on the needs of Navy Programs. The extension of product availability, beyond the OEM assigned date to drop the products as obsolete items, provides stability to the system baseline configuration, during periods of time between installation and scheduled Technical Refresh/ Insertion. The uniqueness of the SSB concept is evident through how it is structured. The OEMs are: a) market driven, b) high volume and high technology, c) their business plan is driven by their commercial customer base, with only about 0.4 % of their business going to Department of Defense (DoD) [1) Glum, 2) Robinson, 3) Hartshorn] and d) experience fast update cycles (< 18 months)[1) Glum, 2) Robinson, 4) McDermott]. In contrast to these OEM attributes, DoD has: 1) unique applications with lengthy life cycles (20-40 years), 2) requires a minimum technology refresh or update cycle of not less than 5 years [4) McDermott], and 3) have operational readiness and maintainability support issue that span the entire life cycle. To bridge the gap between the OEM business planning and the Navy's need for long term support a third party is brought in. This is the Sunset Supplier. The Sunset Supplier makes a contractual relationship with the OEM to produce the obsolete products for the OEM customer base. The OEM transfers the intellectual property and assembly know-how to the Sunset Supplier and for this the OEM receives royalty on the sale of all products produced. Internal to the Navy are support infrastructures to ensure supportability of sunset products by mitigating any component part obsolescence issues if they exist on those products. The infrastructure and support of the SSB process yields, not only significant cost savings, but also provides other benefits, such as:

- Supportability of products defined by customer need (5, 10, 15, 20 years.)
- Life Cycle Cost (LCC) savings, due to no life-time buy at the assembly level is needed, so the assemblies are procured as the customer requires them.
- Reparability of assemblies over the designated life cycle(5, 10, 15, 20 years)

- Hardware/Software/Firmware stability between Technology Refresh/Insertion Cycles.
- Significant reduction in program risk as related to COTS and life cycle management.
- Improved schedule flexibility and support options that can be tailored for Fleet needs.
- Minimal or no impact on system operational performance. The performance will remain constant through the use of exactly the same part: form, fit, and function replacement, which has been made by the alternate manufacturer, the Sunset Supplier.

II. ENVIRONMENTAL ANALYSIS

A. THE EXTERNAL ENVIRONMENT

1. Competitive Forces

The Sunset Supply Base (SSB) system is designed to work with existing support systems as an interfacing method to optimize solutions in managing the obsolescence risk on Commercial-off-the-shelf (COTS) electronic products. The environment of Diminishing Manufacturer Sources and Material Suppliers (DMSMS) is complex because each of the groups or entities set up to address these issues are established and function independently of any other entity. There are many working groups functioning independently and concurrently. [5) Overstreet] Below are some examples:

1) Department of Defense level
2) Each of the services (Army, Navy, Air Force, Marine Corps)
3) The Defense Logistics Agency
4) Most major Program Management Offices (PMO) have programmatic teams and many other lower level groups and teams that have been established just within the Department of Defense.
5) Every major prime contractor to DoD, establishes their own internal working groups and teams.
6) Most of the well-established industry working groups, associations, and societies also have set up teams or groups to work the DMSMS issues.

Although the SSB system is designed to work with this diversity of incongruent problem solvers, not all participants perceive it in that context. Competitive attributes or characteristics that will impede or totally block the SSB system can be categorized into several groups.

B. COMPETITION CATEGORIES

1. Resource Competition

In this category the available resources, primarily funding, take priority over incorporating another way to do business even if it is better and more appropriate in lowering the obsolescence risk to the program or entity evolved. This type of view point looks at the funding potential as a zero sum game -- if they need to add another group or function, the end result is less funding to the existing funded groups or entities. This

barrier to entry is more complex than providing a compelling business case for the SSB systems inclusion, it will require a cultural shift to work collaboratively instead of competitively. Some extremely active and powerful groups within this category are the DoD and service branch (Army, Navy, etc.) field activities. This behavior is referred to as a "rice bowl" mentality and has a long-standing tradition with a complete culture that supports it.

2. Territorial Competition

Each entity has its reasons in taking care of its own problems and challenges. Among these reasons the most prominent is self-preservation, that is, being perceived as the activity or entity of choice when the customer needs DMSMS issues resolved. This situation has always existed but it was exacerbated when the Acquisition Reform (AR) policies and practices encouraged competition between the various support functions. Entrance of the SSB system into the existing DMSMS tools, methods, and processes is viewed as an undefined risk and possibly as a territorial breach. Territorial boundaries are expected across service branches but in the case of DMSMS the boundaries can be scribed down to the lowest level working groups and teams.

3. Contractual Competition

The traditional contracting practices are being displaced by a new set of performance based contracts that shift the burden of responsibility onto the contractor for design, manufacturing, and support. These contracts may take various degrees of responsibility sharing between the government and the contractor, especially with respect to support of fielded systems. Regardless of the split in responsibility, a tension between the customer, the government, and the contractor usually develops regarding DMSMS management. Here the golden rule applies – "He who has the gold, makes the rules". In terms of the competitive environment, the issues affecting DMSMS resolutions will be decided when the funds and contracted responsibility are partitioned with the only real arbitrator being the way the contractor receives incentives through the contract language.

4. Functional Competition

Although the utility of having an Integrated Product Teaming (IPT) environment has been well documented, a good percentage of the working groups and teams do not

implement the concepts. The impact to the DMSMS efforts due to lack of an IPT environment is a fragmented approach that produces “Stovepipe” functional group activities. These “Stovepipe” activities lack the overarching cohesive structure provided by a Systems Engineering approach and many times yield functional areas where protectionism and information hiding is an accepted practice. An IPT environment will be composed of some combination of the following functions: DMSMS specialists, Integrated Logistic Support, Sustainment Engineering, design engineering, procurement, contracts, business management, and Program Management Office (PMO) -- and these functions must work together in developing solutions. The impact of the “Stovepipe” mindset by any one function may limit the potential solution options. The SSB system as a solution option is designed to impact every functional area on the support team and, when interfacing with this isolationist disposition, will challenge that functional area to participate. The SSB system is a collaborative system that necessitates voluntary participation and if a functional area uses the “Stovepipe” mentality it becomes readily apparent to the entire team as an area of concern. The inevitable confrontation between the SSB system and the isolationists will usually be exhibited as functional competition.

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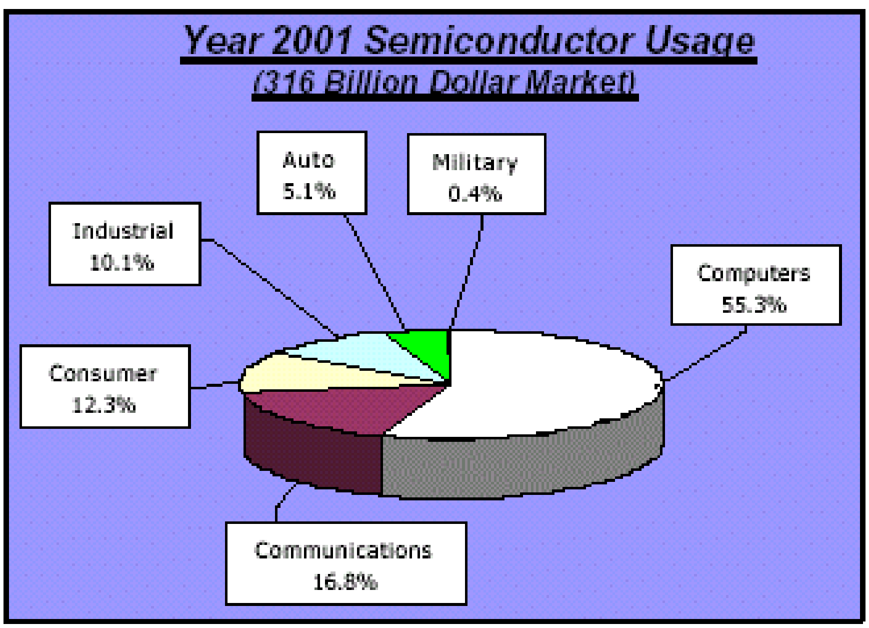
III. THE MARKET PLACE & THE PLAYERS

A. THE MARKETS

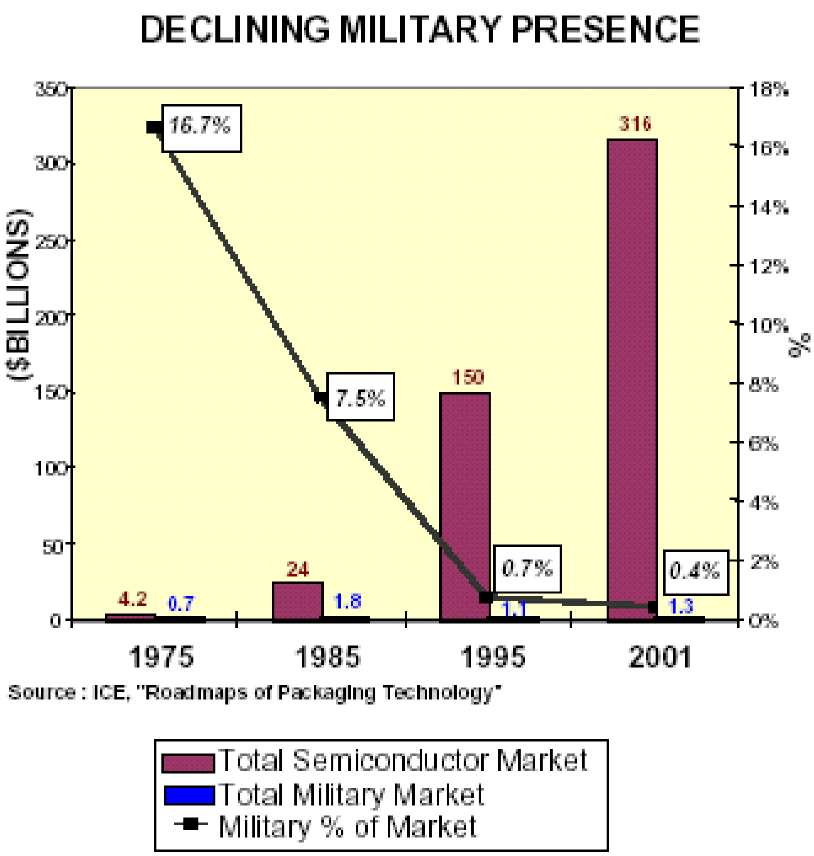
There are three primary market segments, which constitute the microelectronics market place each with a unique environment. The microelectronic market place is important to the DoD/military consumers because the majority of the weapons and support systems derive their functionality and performance from the microelectronics attributes. There are three primary market segments each with a unique environment that constitute the Market Place. The first of these segments is the commercial market; characterized by fast paced, intense competition, driven by market forces, and state-of-the-art technology and innovation. This commercial market segment (89.5%) is illustrated in Figure 1 [3) Hartshorn] and is the sum of the combined sub-markets of Communication (16.8%), Consumer (12.3%), Auto (5.1%), and Computers (55.3%). The perception of supportability for fielded products given this market driven environment, is that of upgrading to the newest technology on a continuous basis and retire the older technology. The approach taken regarding the COTS obsolescence risk is viewed by this segment as an opportunity to sell more of the newer products because the products are considered either throw away items or the cost of doing business. This segment is by far the largest consumer of the COTS products and therefore the prime motivational force which drives the Original Equipment Manufacturers (OEMs).

The second largest customer of COTS products making up the next segment of the market is the industrial consumer (10.1%). This segment has a whole range of applications and consumption habits. Depending on the application, the amount of capital investment and type of competitive pressures, taken together, will determine the approach taken regarding the COTS obsolescence risk. The industrial segment consumes COTS products in the mid range of volume, incorporating them as part of the end item to sell or used in producing some other product such as their use in paper mills, petroleum distillate plants, and in pharmaceutical manufacturing facilities. The impact of obsolescence on those COTS products consumed to make end products is considered minimal because the end products are redesigned to accommodate the newer versions or

newest technology offered by the market; typically these type end products have minimal support and certification requirements. The other primary application for COTS products consumed by the industrial segment integrates these COTS products into larger systems, which are capitally intensive and configuration constrained. Examples of these types of systems include such items as aircraft, industrial production facilities, medical equipment, safety and life support equipment. Many of these systems necessitate additional support requirements such as certification or complex and involved start-up processes taking up to a year to get online. The smallest of the three primary segments is the government procurement (0.4%) portion of the market, consumed predominately in the defense products. This small segment has a greater amount of constraints levied against it than any other market segment. The government segment is capitally intensive and configuration constrained with the additional burden of being a highly regulated environment.



Appendix D Figure 1: Year 2001 Semiconductor Usage



Appendix D Figure 2: Declining Military Presence

1. The Players

The players involved with the first market segment are the buyers of the general electronic products. This market includes such items as: games, personal computers, stereos, calculators, handheld computers, televisions, CDs, video recorders/players or any of the millions of consumable electronic devises in the general market place. Although studies and segmentation of this portion of the market could be done it is not within the scope of this evaluation. The important thing to realize is that it is this diverse market segment which provides the driving motivational force for change and innovation in the COTS products. These market driven forces directly impact the rate of change in the products and the subsequent short cycle times from product introduction to product discontinuance resulting in the obsolescence of the COTS products.

The industrial market place is divided into two groups: the followers and the extended users. The follower group has the capability to track their use of COTS products with the commercial market place and, because of their niche market

applications, can completely sidestep the obsolescence risk issues of the COTS products. The players in this group of the industrial market do not play an influential role in mitigation methods for the obsolescence risk for COTS products and therefore are not considered within scope for this evaluation. The industrial market extended users, on the other hand, have an investment in the capital equipment and many are accompanied by additional constraints. Two such constraints are: 1) frozen baseline configuration of capitally intensive equipment, and 2) certification or process requirements. An example of the first constraint is a chemical processing plan which may take up to 5 years to design, 3-5 years to build, and up to 1-2 years to balance and bring into equilibrium for constant processing of end products. The second typical constraint, that of certification, can come in many different forms: Food and Drug Association (FDA) (US & foreign countries), Federal Aviation Administration (FAA), Nuclear Regulatory Commission (NRC), safety certifications, food handling, and a host of other well defined approval and certification requirements. Regardless of the type of constraints, this market segment must identify and mitigate the obsolescence risk due to COTS products in order to maintain the supportability of their fielded systems. The players involved with this market segment are extremely complicated to define because it depends on a number of factors such as: type of industry, the company organizational structure, the structure and requirements of the certifying entity (i.e. FDA may require a doctor's assessment, where as, FAA may call on in-house FAA experts to perform evaluations, etc.). The perturbations imbedded within all these possibilities yields a set of players that has too much variability to categorize into neat groupings and therefore must be lumped into the large grouping of the entire market segment. For the purposes of this market study the influence and impact of the entire group will be taken into account where applicable.

The final market segment, the government segment, has a large and diverse group of players and are the primary focus of this marketing plan. The position in the market place of the government segment group has shifted drastically over the past thirty years to a minor participant (0.4%) as depicted graphically in Figure 2 [3) Hartshorn], leaving the players in this group with little or no leverage in the overall market place. As mentioned earlier these players come from various areas: at the DoD level down to the lowest level program working team, all work the DMSMS issues. Furthermore the DMSMS issues are

system issues requiring teaming from all functional areas: ILS, Sustainment Engineering, design engineering, procurement, contracts, business management, and PMO, from the government side of the house and from the contractors side of the house. Although many support groups have been formed to provide help, guidance, and support the final responsible entity for the long term supportability of fielded hardware is the Program Manager (PM) for the program. In many cases the PMOs are grouped into larger entities called Program Executive Offices (PEO) and will sometimes function cohesively when addressing DMSMS issues although never in complete concert with each other -- the net result is that the DMSMS issues are handled at the PMO level. Therefore the primary players regarding DMSMS issues are the functional participants within any given PMO and all other entities are advisory in nature.

Important to take into account when considering the various players and their roles in the COTS environment and the DMSMS community is the changing contractual landscape employing Performance Based Logistics (PBL) and Contractor Logistic Support (CLS) [6) DUSD L&MR]. The impact of these contract methodologies is the transference of responsibility for long term planning, including the obsolescence risk due to COTS products, to the contractor while subordinating the government's role to an advisory capacity. This changing contractual landscape has a direct impact on who the players are and what role they assume. Therefore the company contracted using PBL or CLS to perform support functions provides another competitive force when considering the SSB system as a potential alternative. When using the PBL or CLS type contracts, the primary player becomes the contractor. The competitive issues which arise with regard to the SSB system, stem from the fact that the SSB system is an internal government functional system and not readily transferable to the contractor. The inherent nature of the SSB system necessitates an independent third party to collaborate with OEMs and SSB suppliers to optimize the best value for the government. The contractor on the other hand, has as their primary motivational force the bottom line profit and supporting the overall business case. If the SSB system is perceived as not being in the contractor's best interest for whatever reason, the SSB system will have no real chance of success. The key strengths of the contractor as a competitor are: 1) the contractor many times was the entity who designed the system in the first place so they possess intimate

knowledge of the system, 2) the contractor has developed working relationships with the government PMO and understands the program's structure, the political environment, and even the short comings of the system, and 3) typically the contractor can provide full service of all necessary functions (i.e. engineering, Integrated Logistic Support (ILS), procurement, test and evaluation, configuration management, etc.).

Given the above scenario, the inherent weaknesses with the contractor as a competitor are: 1) since the SSB system is uniquely a governmental function not directly transferable to the contractor, the contractor must search for other methods to support the COTS products over the long term, and they must do so with an equivalent level of cost, schedule, and performance. Since no other system has been identified, tested, and implemented which shows the same efficiencies as the SSB system, the weakness the contractor must contend with is the amount of risk to the program success due to a less efficient support process. 2) The contractor will have and inherent conflict of interest in supporting COTS long term because of competing interests within their own company. As stated above, PBL & CLS are typically awarded to contractors who can support all functions (i.e. design, maintenance, procurement, etc.) and the company's business case in support of these types of contractors will reflect the amount that each functional area within the company will contribute to the bottom line profits. Without the long-term support of COTS products, the company will need to redesign the system to accommodate a different part when the COTS product goes obsolete and this in turn provides profit margins for the engineering functions. These profit margins from engineering have historically been the cash generator as compared with the margins gained through ILS or procurement functions which contribute only a minor amount of cash generation potential. When using the SSB System for the long-term supportability of COTS products is implemented, the subsequent resulting impact to the engineering functions will yield fewer opportunities for redesign and therefore negative impact to the bottom line profits. The internal conflicts within the PBL/CLS contractor could be resolved to maximize the bottom line profits of the company to the detriment to the supportability of fielded Navy system and unnecessary negative impacts to the systems Life Cycle Cost (LCC). 3) These large full service contractors are burdened by the

contracting constraints of doing business with the government and have adjusted their price of doing business accordingly resulting in an expensive arrangement for the Navy.

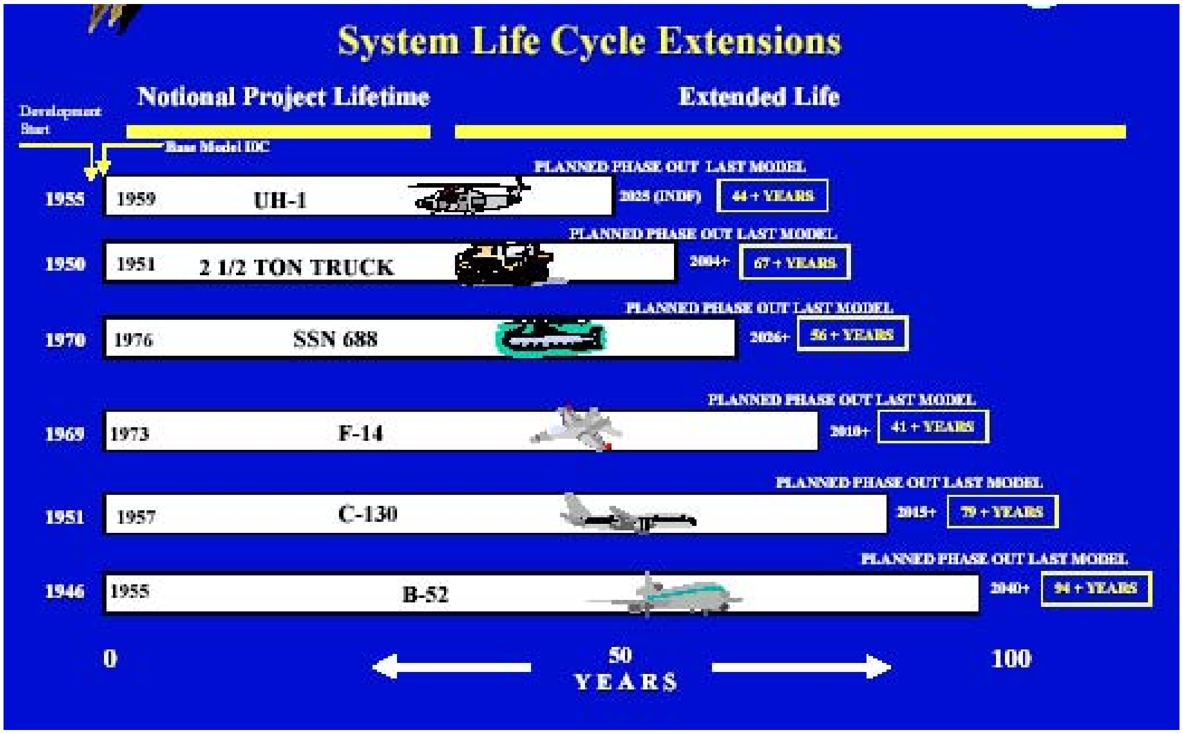
2. Market Place Size

Although, as mentioned above, there are several market segments, which could be analyzed with regard to utilizing the SSB system, for the purposes of this analysis we will consider only a subset of the potential market place, namely the Navy PMOs. Other potential markets such as “Industrial segment extended users” and other government users (i.e. Air Force, DOE, Coast Guard, etc.) will be treated as potential future markets but will not be characterized with respect to size or dollar amounts. Within the Navy’s System Command Structure (SYSCOM) there are three major SYSCOMs which represent the lions share of all acquisition programs for the Navy having an annual procurement budget totaling approximately $43.4 Billion in FY2001 [7) Cowley] and of this total budget only a small fraction is spent on electronic COTS products. Within a SYSCOM the acquisition programs are assigned to Program Management Offices (PMOs) and more than one acquisition program may be assigned to a PMO. The three major SYSCOMs and the quantity of acquisition programs associated with each one are as follows: Naval Sea Systems Command – NAVSEA with 134 programs [8) NAVSEA], Naval Air System Command – NAVAIR with 148 programs [9) NAVAIR], and Space and Warfare System Command – SPAWAR with 83 programs [10) SPAWAR]. The number of programs for each SYSCOM is an estimate base on web published information. The total available estimated market size is the sum of all programs within the Navy and that value is 365 programs.

B. ECONOMIC GROWTH AND STABILITY

The economic growth and stability for the DMSMS communities is in a growth mode because the obsolescence risk issues are getting worse for several reasons: 1) the use of COTS products has been endorsed as the preferred alternative for use in the DoD systems, as identified in the DoD 5000 series documents [11) DoD, 12) DoD, 13) DoD], 2) the service life extension of currently fielded systems – see Figure 3 [14) King], and 3) the fast pace that our Original Equipment Manufacturers (OEM) leave the market with their product before the end of the Navy’s systems service life and sometimes even before the system is fielded. To exacerbate the obsolescence risk issues, the support

structures (i.e. contracting, procurement, ILS, etc.) traditionally used by the Navy were purposely designed to be conservative, deliberate, and methodical which yielded a slow bureaucratic system. The PMOs being the responsible entity to assure the supportability of fielded systems have in the past and will continue to in the future necessitate funding and support of DMSMS activities to meet the Navy's ever increasing need.



Appendix D Figure 3: System Life Cycle Extensions

C. POLITICAL, LEGAL, AND REGULATORY TRENDS

The current trends which take on overtones of political and legal characteristics are activities involving performance based contracting, ranging from Performance Based Logistics (PBL) to Contractor Logistic Support (CLS), on all new procurements wherever possible [7) Cowley]. The impact to the existing DMSMS community could be significant in that, the support responsibility will be approached in a more rigorous manner and have legal ramifications with regards to the contract. There are political forces pushing for contractor involvement in support of fielded systems and abandoning the traditional organic support, this would include DMSMS support as well. Depending on the political environment and the contracting methodology, the existing DMSMS support functions and the SSB system could be excluded from participating. Let us explore this before moving on; if a contract is being evaluated for "Full" PBL to include:

1) engineering evaluations, both new and in-service support, 2) Integrated Logistic Support (ILS), 3) Maintenance and repair support (i.e. Depot level), 4) Procurement support, and 5) DMSMS support – and the contract explicitly states these functions for an indivisible package of support, then the DMSMS support function must go with the contract if it is to be awarded. Traditionally the support of the above functions, have been accomplished internally in the Navy but the functions are not centrally located and are dispersed throughout the various field activities and in the PMO. The dispersed organic functions, in order to participate in bidding on the contract must collectively and collaboratively group together to support the indivisible package of support. In the current internal organic support environment a collaborative, coordinated response is not likely. The scenario provided above is not unique in identifying requirements for PBL contracts, as is shown in Table 1 below. Table 1 is followed by the definitions of the "Type of PBL" so that a better understanding of the table can be achieved by providing context to the information presented. Notice that under the column heading – Provider manages obsolescence - that if the service is defined as being incorporated into the contract, the function always rests with the contractor, although as a potential resolution the contractor, at their discretion, may hire as a subcontractor a government activity or Organic entity.

Type of PBL	Warehousing	Packaging	Depot Repair	Provider performs repair rqmt determination	Provider performs portion of engineering services	Provider manages obsolescence	Provider owns wholesale inventory	Provider determines retail reqmts
Mini-Stock Point (MSP)	X	X						
MSP Plus	X	X		Negotiated				Negotiated
Organic (PBL-O)	X	X	X		X			
Commercial (PBL-C)	X	X	X			X	X	
Partnership (PBL-P)	X	X	X	X	X	X	Negotiated	
"Full" PBL	X	X	X	X	X	X	Negotiated	Negotiated
Total Logistics Support	X	X	X	X	X	X	X	X

Appendix D Table 1: Illustrates the various PBL categories and their associated attributes

D. PERFORMANCE BASED LOGISTICS DEFINITIONS

The following categories are used by Naval Inventory Control Point (NAVICP) to describe the various types of PBL arrangements [15) NAVICP]:

PBL-Mini-Stock Point (PBL-MSP):

Navy owns the inventory…contractor receives, stores, issues, and may also repair the material… "MSP-Plus" includes a negotiated level of requirements determination (MIN/MAX).

PBL-Organic (PBL-O)

An arrangement with an organic activity (normally via Memorandum of Agreement) to procure, repair, stock and issue material.

PBL-Commercial (PBL-C):

An arrangement where commercial items are supplied by the contractor. Customer requisitions are automatically routed through procurement system (ITIMP) directly to the contractor as a delivery order.

PBL-Partnership (PBL-P):

An arrangement between a contractor and Navy such that the Navy performs a portion of support required by and for the contractor. For example, the contractor may sub-contract the Navy to perform maintenance support at an organic depot. This can be highly beneficial when addressing Core maintenance issues, in that the Navy is able to retain Core capability while acting as a "sub" to the contractor.

"Full" PBL:

A contractual arrangement where the contractor manages (and may also own) the inventory, determines stockage levels, typically repairs NRFI material, and is required to meet specific performance metrics. Requisitions still flow through ICP, and ICP pays the contractor for performance but bills customers traditionally. Reliability improvements, technology insertion and reduced obsolescence may be some of the inherent benefits of a Full PBL. The contractor usually is given Class II ECP authority and in some cases may also have configuration control. Additionally, Logistics Engineering Change Proposal (LECP) arrangements will be considered a subset of this category if they contain supply support clauses that fall under the definition noted above.

Total Logistics Support:

A most robust form of PBL (typically referred to as Contractor Logistics Support (CLS)), where the contractor manages most or all facets of logistic support (i.e. ILS

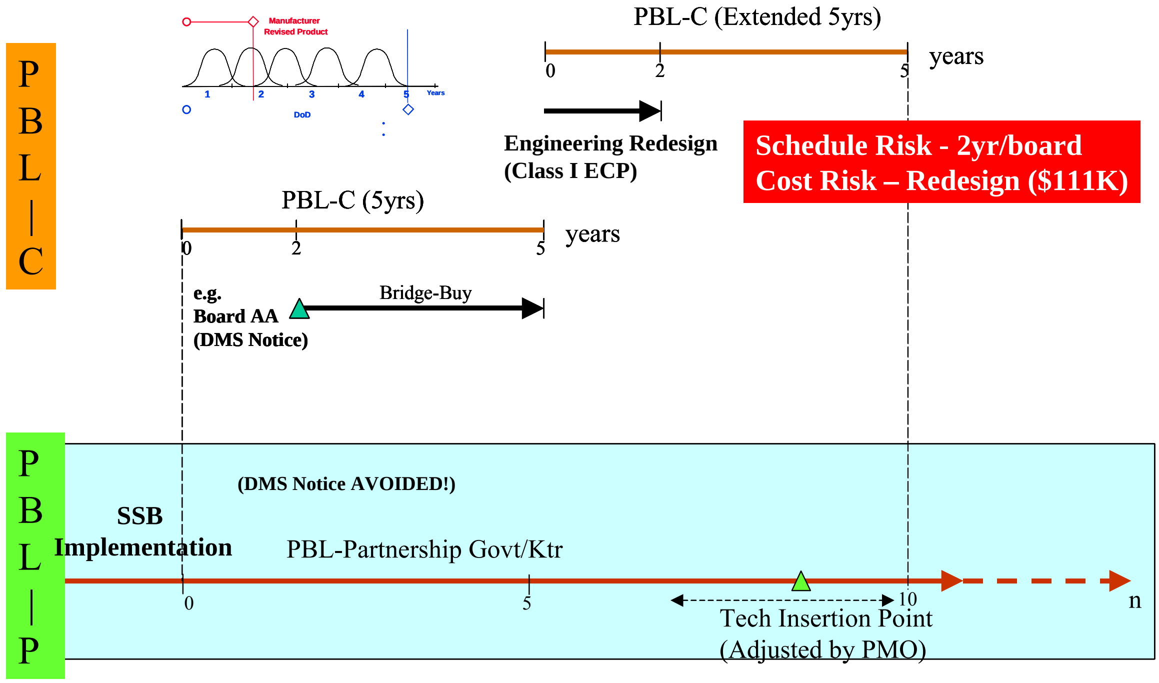
elements), including inventory levels, maintenance philosophy, training manuals, PHS&T, full configuration control, support equipment, etc.

Taken over time, the effects of this type of contracting will decimate the Navy's internal DMSMS support capability leaving it in the hands of the contractors. There is an important tie to the political environment. The contractors in the defense industry have, for a long time, been lobbying Congress to allow them more control over the systems they design and develop. These contractors have a great deal of influence with the congressional representatives, in that, the representative's constituencies, may and often do, work for these large defense contractors. Additionally the contractors have been known to move manufacturing/assembly operations into a specific congressional district to entice a favorable and supportive political ally. With the past years of declining defense budget for new acquisition programs and the natural increase of the support budget being spent on the ageing assets, the contractor's interest in the support portion of the market has intensified. There is currently no counteracting force from the internal Navy support functions/activities to counter balance this move by the defense contractors. The performance based contracting process is a mechanism developed to shift the amount of contractor involvement in all areas and of special interest is their expanding role in the support area of the market. The premise for the argument given by the contractor driving the need for change is the cost reductions possible by using the more efficient processes and methods available at the contractors, and in leveraging the industrial base community. The foundation documents, discussed in subsequent paragraphs, put in place to establish the performance based contracting methodology, identify this cost focus as the primary discriminating criteria. The guidance documents, discussed in subsequent paragraphs, used to implement the methods, go beyond the cost criteria by adding additional caveats and restrictions, such as an "all or nothing" involvement, for functionally different but related portions of the support effort. Furthermore, by dictating the allocation of certain functions to be accomplished by specific entities, the guidance documents constrain the cost focus of the foundational documents potentially yielding sub-optimal results. Other considerations regarding the guidance documents are the methods, tools, and processes used to implement the requirements of the document. These practices have a direct impact on the decisions surrounding the award of the

performance based contracts. Central to the decision making process regarding the potential use of a PBL contract is the development of the Business Case Analysis (BCA). The ground rules currently used in developing the baseline cost estimates for Organic support (i.e. in-house Navy support activity) uses historical performance data and compares this data with contractor proposed estimates in evaluating cost effectiveness of the contractor's proposed cost. Important to notice is that the Organic support costs rely solely on the past data and by doing the analysis in this manner three major assumptions are made: 1) the past performance data is accurate, applied in an appropriate manner, and the data reflects current and future performance of the Organic activities/functions, 2) there are no opportunities to reduce, streamline, or improve the Organic cost figures, and 3) the Organic activities/functions would not be affected by the competitive environment. Applying historical costs to the Organic entities and comparing these to the cost estimates in a proposal from the contractor yields a bias in favor of the contractor. Although this type of analysis is considered to be a competitive environment where the lowest cost gets the contract, the process side steps many of the tenets of true competition. The implementation methods employed in developing performance based contracts handicaps the Organic activity/function, provides a "non level playing field", and in no way assures the Navy receives the best possible value available in today's market place.

The combination of the change in focus and the exclusionary policies invoked by the guidance documents and implementation policies, defines a new system and, as in all systems, there will be new and emerging attributes that may be supportive or counter productive to the initial purposes of the foundational objectives. One of these counter productive attributes that has some disturbing unintended consequences, deals with a "built in" conflict of interest for the contractor during the performance period of the PBL contract. This inherent conflict of interest is a result of the interrelationship between the Engineering Design functions and the Sustainment Engineering functions providing DMSMS support. Since both of these functions are controlled by the contractor where non Organic support methods are used, decisions will necessitate the trade-off between better bottom line profits for the company or best value for the Navy evident in lowest Life Cycle Cost (LCC) and/or Total Ownership Cost (TOC). To illustrate this interrelationship, Figure 4 identifies a typical example in notional graphical form and

provides a ready reference in explaining the cause and effect relationship between the two functions and helps uncover the inherent conflict of interest experienced by the contractor.



Appendix D Figure 4: Performance based Contract Scenarios

Figure 4 Illustrates two scenarios for different types of performance based contracts: PBL – C, Performance Based Logistic contract having the contractor as the sole provider, PBL – P, Performance Based Logistic contract having the contractor as the lead and partnering with Organic activities/functions to provide contract support. The type of Organic support specified in the example implements the SSB system. For both scenarios a singular occurrence of obsolescence notice for a generic assembly – Board AA – provides an example to show how each contract type typically would support the program given current PBL implementation practices.

Most PBL – C contracts are written for a period of a 5 year support window with a follow-on Navy option for another 5 years. Included as part of the contract responsibilities are the DMSMS issues, that occur during the contract period but support is limited to the contracted period only. All other support cost and subsequent impacts regarding the obsolescence issue must be dealt with using other contracting methods since those impacts are beyond the scope of the 5 year contracted period. Board AA in

the example given above, goes obsolete 2 years into the 5 year contracted period. In response to this issue the contractor is obligated to provide the board for the entire contracted period and to meet this commitment the contractor most often will chose to perform a Life of Type Buy (LTB) or also called a Bridge buy. Depending on the contract language the contractor may or may not be required to notify the supported program that the mitigating activity of the Bridge buy has taken place. This Bridge buy indicates a future risk to the supportability of the impacted program. Regardless of notification to the program by the contractor the end of the first 5 year PBL – C contract exposes the supportability risk to the program. Even if the program was notified of the impending engineering analysis and potential redesign, the PBL – C contracts consider such efforts to be out of scope and therefore must be dealt with another way. If the program had chosen to do nothing about the notice or if they were never told about the issue, the program can no longer be supported by Board AA and another alternative must be found, typically this takes up to 2 years for full qualification. The PMO must deal with not only the 2 year supportability risk but they must also pay for the alternate solution to be developed and implemented. The cost for such solutions have large variability but for minor redesign the amounts range from $22,400 to $250,000 with an average of $111,034 [16) DMEA]. These costs identify only the Design Engineering efforts which does not include the other necessary support functions/actions (i.e. procurement, Configuration Management, ILS support, etc.) Provided with the comparison between the PBL-C and the PBL-P, a quick inspection of the notional graphical example illustrates the difference between the two contracting methods predominantly that of lower risk and less cost of the PBL-P support. This PBL-P support method should be considered as a potential alternative method of support and contained within the solution space. In an effort to examine the total environment with respect to the political, legal, and contracting issues, a detailed review of both the foundational and implementation guidance documents will be accomplished so that potential alternative paths can be uncovered. However, prior to looking at these regulatory documents the role that engineering plays in the decision making processes needs to be expanded upon in order to overlay the context of the supportability issues to the Life Cycle Cost (LCC) impacts.

The engineering functions are all about Trade-offs and balance of requirements and needs. In the example provided in Figure 4, it is readily evident that there are Trade-offs between the Sustainment Engineering function and the Design Engineering function, in that, one function can and will affect the inclusion or exclusion of the other function. This interrelationship has an important association to the type of response the PMO will receive from a sole source contractor controlling both functions when providing supportability alternatives. If the contractor was able to provide a support system that was of such a high quality that is was the most cost effective, lowest risk, and provided the performance that met the customers needs, then the impact may take the Design Engineering function completely out of the solution space. Conversely, if the perfect design solution was formulated to allow an easily upgradeable system at lowest cost, with no impact to operations, then the Sustainment Engineering function would drop to an extremely low amount. Although both cases stated here are hypothetical, it is important to realize the Trade-offs that must be undertaken when considering alternatives for a particular solution space. Some solutions within this solution space are less than desirable for the Navy. Remembering that one of the primary driving parameters, which must be satisfied by the contractor, is to achieve the best bottom line profits, this includes all functions and operations. Combining this bottom line focus with the current implementation guidelines provides unintentional incentives for the contractor to optimize the bottom line focus for both functions, instead of providing the "best value" for the Navy. The current guidance documents ignore the need for the "checks and balances" in providing good tension to obtain the best possible solution. Like "cost and performance" as a pairing provide good tension, Sustainment Engineering and Design Engineering need to be paired to compare and contrast various alternatives in the solution space. Furthermore, these engineering discipline areas must be independently evaluated or decoupled from one another to maintain this good tension. As a result of the bottom line incentive focus of our contractors, independent evaluation or decoupling of the two engineering functions is impractical and may be impossible. Given the current guidelines for PBL contracting, our contractors are provided incentives to yield solutions, which may not be and probably are not optimal for the Navy. Understanding the current status of incentives provided to the contractor and the potential outcome is important in

considering better alternatives that provide the good tension in an effort to achieve the "best value" for the Navy. Until other incentives are available which provide the "good tension" scenarios, that can provide "best value" for the Navy, perhaps the DMSMS support functions should not be contracted out but kept as an in-house function. The most appropriate alternative, given the current contracting methods, is to define the Sustainment Engineering function, especially with regards to DMSMS solutions, as an inherently governmental function. The amount of judgment calls and decisions made in developing DMSMS solutions will by default define latter actions to be taken by the PMO in contracting for goods and services. With the current guidance, the PMO may or may not be informed of these decisions and/or possibilities, whereby the contractor in essence makes future PMO decisions because of today's DMSMS solutions alternatives. The net result of the interaction between current decisions and future decisions, with or without the PMO knowledge, identifies a situation in which the contractors are at their discretion making PMO decisions. As identified below in review of the foundational and guidance documents, these types of involved decision-making processes are reserved for inherently governmental functions only. However, due to variability in the contracting process the DMSMS support functions are at times contracted out using the PBL contracting methods. Therefore the contracting environment (i.e. competitive, non-competitive) as identified by the foundational and guidance documentation should be reviewed.

IV. THE PERFORMANCE BASED CONTRACTING ENVIRONMENT

In this section the direction provided through both sets of documents, foundational and guidance, will be evaluated with respect to: 1) Responsibility of the Contractor versus that of the Government, and 2) The Contracting Environment. These two evaluation criteria were chosen to address the questions: What if - DMSMS support functions were defined to be "inherent Governmental functions" then do the documents provide adequate definition and justification? Secondly, if the DMSMS support functions were considered a commercial activity then - What is the resulting contracting environment, as defined in these documents? Finally to close out the section a conclusion paragraph will summarize and identify the potential impact to the SSB implementation efforts.

A. THE FOUNDATIONAL PERFORMANCE BASED CONTRACTING DOCUMENTATION

The following references and documents are considered as the foundational set of documents in evaluating the Performance Based Contracting (PBC) requirements:

- DoD Directive 5000.1 [11) DoD]
- DoD Instruction 5000.2 [12) DoD]
- DoD Regulation 5000.2-R [13) DoD]
- OMB Circular No. A-11 [17) OMB]
- OMB Circular No. A-76 [18) OMB]
- OMB Circular No. A-76 [19) OMB]

B. RESPONSIBILITY OF THE CONTRACTOR VERSUS THAT OF THE GOVERNMENT

The 5000 series documents identify the need to streamline the acquisition and support process while focusing on performance criteria as the preeminent evaluation characteristic. These documents identify Life Cycle Cost (LCC) and Total Ownership Cost (TOC) as the driving mechanism to receive "best value" for the DoD. In essence, the 5000 series documents describe the backdrop for changes but focus on "best value" while improving the support system for the warfighter. The methods, processes, and

tools identified in the documents rely heavily on the use of a Systems Engineering approach in assuring that an overarching view of the systems life cycle process is taken into account. In setting the stage for allowing a performance based contracting approach, OMB Circular A-11 identifies the budgetary process wherein Appendix 8 – “Alternative Competitions and OMB Circular A-76” - describes a summary of a referenced document and explains how the cost comparison process is designed to deliver “best value” to the government: Appendix 8 specifically states:

> Circular A-76 provides a minimum level of analytic rigor for the evaluation of these alternatives. It is designed to: (1) balance the interests of the parties; (2) provide a level playing field between public and private offerors; and (3) encourage competition and customer choice.

With these expectations from the budgetary process in mind we will next look at the requirements provided in OMB Circular A-76. The A-76 first identifies what an inherently Governmental function is and, due to the impact this definition has on the requirements detailed in the remainder of the document, it is important to understand this perspective. As part of the definition description, the following statements are extracted from the full text:

> An <u>inherently Governmental function</u> is a function which is so intimately related to the public interest as to mandate performance by Government employees. Consistent with definitions provided in the Federal Activities Inventory Act of 1998 and OFPP Policy Letter 92-1, these functions include those activities which require either the exercise of discretion in applying Government authority or the use of value judgment in making decisions for the Government...Inherently Governmental functions normally fall into two categories: (1) The <u>act of governing</u>; i.e., the discretionary exercise of Government authority. Examples include…. combat support or combat service support role...selection of program priorities; direction of Federal employees...[20) OFPP]

Due the nature and long-term impacts with regards to DMSMS support functions and their irreversible influence on future PMO decisions, the issue of the “act of governing” is as real problem which could yield blanket approval authority to the contractor to act on behalf of the PMO. To add additional perspective regarding inherently Governmental functions a review of the OFPP Policy Letter 92-1 yields the following descriptions:

Agencies have occasionally relied on contractors to perform certain functions in such a way as to raise questions about whether Government policy is being created by private persons...

As a matter of policy, and “inherently governmental function” is a function that is so intimately related to the public interest as to mandate performance by Government employees. These functions include those activities that require either the exercise of discretion in applying Government authority or the making of value judgements in making decisions for the Government...

An inherently governmental function involves, among other things, the interpretation and execution of the laws of the United States so as to:

(a)bind the United States to take or not to take some action by contract, policy, regulation, authorization, order, or otherwise;

(b)determine, protect, and advance its economic, political, territorial, property, or other interests by military or diplomatic action, civil or criminal judicial proceedings, contract management, or otherwise...

(d)Commission, appoint, direct, or control officers or employees of the United States; or

(e) exert ultimate control over the acquisition, use or disposition of the property, real or personal, tangible or intangible, of the United States...”

7. Guidelines... (a) *The exercise of discretion*. While inherently governmental functions necessarily involve the exercise of substantial discretion, not every exercise of discretion is evidence that such a function is involved. Rather the use of discretion must have the effect of committing the Federal Government to a course of action when two or more alternatives course of action exist...

7. Guidelines...(b) Totality of the circumstances....(2) The degree to which official discretion is or would be limited, i.e., whether the contractor’s involvement in agency functions is or would be so extensive or his or her work product is so far advanced toward completion that the agency’s ability to develop and consider options other than those provided by the contractor is restricted....

Appendix A to OFFP Policy Letter 92-1- The following is an illustrative list of functions considered to be inherently governmental functions:

6. The determination of Federal program priorities or budget requests...

7. The direction and control of Federal employees ...

11... (a) determining what supplies or services are to be acquired by the Government...

16. The determination of budget policy, guidance, and strategy.

Summary: Responsibility of the Contractor versus that of the Government

A short summary and evaluation of the extracted portions of the documents identified above will provide some concise understanding in determining if the DMSMS support functions are or are not inherently governmental functions. The DoD 5000 series documents provide the upper most level of guidance and the context for implementation of Performance Based Contracting (PBC) focusing primarily on using the Systems Engineering approach to yield the "best value" for the Navy. OMB Circular No. A-11 sets the expectation from a budgetary perspective that uses OMB Circular No. A-76 criteria resulting in an environment which: balances the interest of the parties, provides a level playing field, and promotes competition while increasing customer choice. The guidance provided, thus far, places no constraints on "what" entity is performing the function and specifically in our case does not identify "who" should accomplish the support function for the PMO. The next set of extracts from the OMB Circular No. A-76 and the OFPP Policy Letter 92-1 identify several instances, which must be taken into account when deciding "who" is the appropriate entity to perform certain functions and engage in the PMO decision making processes. Several issues are described which would define certain functions to be set aside as "inherently governmental functions" . The primary issues identified include:

- act of governing; i.e., the discretionary exercise of Government authority,
- use of value judgment in making decisions for the Government,
- selection of program priorities,
- direction of Federal employees,
- bind the United States to take or not to take some action,
- exert ultimate control over the acquisition, use or disposition of the property,

- committing the Federal Government to a course of action when two or more alternatives course of action exist,
- product is so far advanced toward completion that the agency's ability to develop and consider options other than those provided by the contractor is restricted,
- determining what supplies or services are to be acquired by the Government, and
- determination of Federal program priorities or budget requests.

Considering the discussion regarding the impacts that DMSMS support functions have on the PMO's current and future decision making processes, then applying the definition of "inherently governmental functions" some logical conclusions can be drawn regarding the DMSMS functions. As described earlier the DMSMS support functions require the use of value judgments and when made, dictate the future discretionary exercise of Government authority. Furthermore these support decisions bind the government to a course of action, sometimes to a very specific course of action like redesign. Depending on the support strategy the DMSMS support decisions may lead to scenarios that constrain the PMO's priorities, budgets, and options to only those potential outcomes identified by the DMSMS support provider. Additionally the highest level guidance documents, the DoD 5000 series, endorse the use of the Systems Engineering approach which has a one of its primary tenets – the use of "good tension" in performing Trade-offs and achieving "best value". Previous discussion regarding the DMSMS support functions identified the "conflict of interest" issue when a contractor had total control over both the Sustainment Engineering and Design Engineering functions. The "conflict of interest", the lack of having "good tension", the use of value judgments, and the irreversible and binding decision making necessary in performing the DMSMS support function identify these functions as "inherently governmental functions".

C. THE CONTRACTING ENVIRONMENT:

1. Excerpts DoD 5000.1

The DoD 5000.1 document specifically addresses Performance –Based Acquisition and the methods and practices needed to support that type of acquisition. The following are excerpts from DoD 5000.1 that help describe the expectation and requirements of the contracting environment:

4.2.4 – Performance-Based Acquisition.

In order to maximize competition, innovation, and interoperability, and to enable greater flexibility in capitalizing on commercial technologies to reduce costs, performance-based strategies for the acquisition of products and services shall be considered and used whenever practical..

4.3.3. – Competition.

Competition is critical for providing innovation, product quality, and affordability. All DoD Components shall acquire systems, subsystems, equipment, supplies and services in accordance with the statutory requirements for competition. Competition provides major incentives to industry and Government organizations to reduce cost and increase quality. The Department must take all necessary actions to promote a competitive environment, including examination of alternative systems to meet stated mission needs; structuring Science and Technology investments and acquisition strategies to ensure the availability of competitive suppliers throughout a program's life and for future programs…

4.4.1. – Total Systems Approach.

Acquisition programs shall be managed to optimize total system performance and minimize total ownership costs by addressing both the equipment and the human part of the total system equation, through application of systems engineering…

4.4.2 – Logistic Transformation.

Logistics transformation is fundamental to acquisition reform. Decision-makers shall take all appropriate enabling actions to integrate acquisition and logistics to ensure a superior product support process. The Department shall strive for an integrated acquisition and logistics process characterized by constant focus on total cost of ownership; supportability as a key design and performance factor; logistics emphasis in the systems engineering process; and that meets the challenges of rapidly evolving logistics systems supporting joint operational forces.

OMB Circular A-76 & Supplemental Handbook defines several criteria, which impact the PBL contracting environment. The following are excerpts from these documents:

Circular A-76

5. Policy…a. Achieve Economy and Enhance Productivity. Competition enhances quality, economy, and productivity. Whenever commercial sector performance of a Government operated commercial activity is permissible, in accordance with this Circular and its Supplement, comparison of the cost of contracting and the cost of in-house performance shall be performed to determine who will do the work. When conducting cost comparisons, agencies must ensure that all costs are considered and that these costs are realistic and fair.

6. Definitions….f. A cost comparison is the process of developing an estimate of the cost of Government performance of a commercial activity and comparing it, in accordance with the requirements of the Supplement, to the cost to the Government for contract performance of the activity.

8. Government Performance of a Commercial Activity…d. Lower cost. Government performance of a commercial activity is authorized if a cost comparison prepared in accordance with the Supplement demonstrates that the Government is operating or can operate the activity on an ongoing basis at an estimated lower cost than a qualified commercial source.

Circular A-76 Supplemental Handbook

Introduction…….Circular A-76 is not designed to simply contract out. Rather, it is designed to: (1) balance the interests of the parties to make or buy cost comparison, (2) provide a level playing field between public and private offerors to a competition, and (3) encourage competition and choice in the management and performance of commercial activities……..Reliable cost and performance information is crucial to the effective management of Government operations and to the conduct of competitions between public or private sector offerors.

Chapter 1 – General Provisions….C. Government Performance of Commercial Activities…3. Core Capability. – A minimum core capability of specialized, scientific or technical in-house or contract employees and related commercial workload, may be maintained, without cost comparison, to ensure that the Government has the necessary capabilities to fulfill its mission responsibilities or meet emergency requirement.

Government Performance of Commercial Activities…7. Meet Performance Standard…a. Performance by in-house, contract or ISSA may be authorized if an agency demonstrated that performance meets or exceeds generally recognized industry performance and cost standards.

> Government Performance of Commercial Activities…8. Lower Cost. – In-house, contract or ISSA performance of a commercial activity may be warranted by the results of a cost comparison conducted in accordance with the procedures described in this Supplement.
>
> G. Review of Documents….1. Access to Supporting Documentation. – a. At the earliest possible stages of development, consistent with procurement and conflict of interest requirements, affected parties will have the opportunity to fully participate in the development of supporting documents and proposals, including the development of performance standards, performance work statements, management plans, and the development of in-house and contract cost estimates. – b. Upon issuance, a solicitation used in the conduct of a cost comparison will be made available to directly affected Federal employees or their representatives for comment. The employees or their representatives will be given sufficient time to review the document and submit comments before final receipt of offers from the private sector.
>
> Chapter 3 –Cost Comparisons…B. The Cost Comparison Study Team…1… The team should document mission requirements and seek new and innovative ways to provide the required products or services….
>
> Chapter 3 –Cost Comparisons…C. Performance Work Statements…1. Performance Work Statements (PWS) should be developed for all activities being resolicited for contract or scheduled for direct conversion to or from in-house, contract or ISSA performance……4. Special care should be taken when developing the PWS to ensure that it does not limit service options, arbitrarily increase risk, reduce competition, unnecessarily violate industry service or service grouping norms or omit statutory or regulatory requirements without full justification……..

2. Summary

The DoD 5000 series documents require the contracting environment to maximize competition and considers it critical in providing innovation, product quality, affordability and reducing costs from both government and industry providers alike. Through the use of the Systems Engineering approach, an integrated acquisition and logistic process must focus on Total Ownership Cost (TOC); supportability as a key design and performance factor. The OMB Circular A-76 requires through policy statements, the use of competition to enhance quality, economy, and productivity. These enhancements are possible by performing cost comparisons of commercial activities performed by the government, with contracted commercial activities from either within

the government or from industry. Circular A-76 is not designed to simply contract out. Rather, it is designed to: (1) balance the interests of the parties to make or buy cost comparison, (2) provide a level playing field between public and private offerors to a competition, and (3) encourage competition and choice in the management and performance of commercial activities

D. PERFORMANCE BASED CONTRACTING IMPLEMENTATION GUIDANCE DOCUMENTATION:

1. Excerpts

The following references and documents are considered as the implementation guidance set of documents in evaluating the Performance Based Contracting (PBC) requirements:

- Product Support Guide: Product Support A Program Manager's Guide to Buying Performance [6) DUSD L&MR]
- Performance Based Logistics: NAVICP Fact Sheet [15) NAVICP]
- Performance Based Logistics Business Case Analysis (BCA) [15) NAVICP]

The following are excerpts from Product Support A Program Manager's Guide to Buying Performance and are chosen because the excerpt identifies a new requirement or a further refinement of higher level requirement which will impact implementation efforts

> 1.3 Performance-Based Logistics…..PMs will implement PBL on all new systems and on Acquisition Category I and II fielded systems selected on the basis of a sound business case……

> 2.7 Developing Program Baseline Performance and Cost……For legacy systems, the Baseline assessments form the basis for business case analysis of PBL approaches being considered. In conducting the business case analysis, alternative solutions are assessed in terms of their ability to meet the logistics performance objectives of the warfighters compared particularly to existing support strategies.

> 2.9 Establishing a Product Support Integration Function….A concluding step in developing a product support strategy is establishing a product support integrator function. As with the PBL strategy and the agreement with the warfighter, the product support integration function is a key component of the product support strategy documented in the acquisition strategy.

The following are excerpts from – NAVICP Performance Based Logistics Fact Sheet and are chosen because the excerpt identifies a new requirement or a further refinement of higher level requirement which will impact implementation efforts:

> Concept….Under the PBL program, NAVICP awards a contract to a single supplier….
>
> PBL suppliers may take on a number of functions normally performed by various Departments of Defense (DoD) services or agencies….
>
> Arrangements may be made with industry partners supporting commercially available equipment, with industry partners supporting military unique equipment, government activities supporting military unique equipment or industry partners who have government activities functioning as their sub-vendors……
>
> Potential candidates can be broken down into two categories. Category I items are those we should automatically pursue as PBL contracts. Category II items are those we should consider as PBL candidates……
>
> Category I Items (automatic PBL candidates):…c. New Items/Systems: These are items/systems being introduced into the Navy/Marine Corps. These systems are very early in their life cycle and are at a point where maximum financial benefit can be derived from a PBL. An early PBL decision can avoid costly investment in test equipment, training, Logistics Support Analysis (LSA) development, wholesale spares investment, etc…..
>
> Category II Items (possible PBL candidates):…Items/systems not covered under Category I where we are experiencing difficulty providing adequate support to our fleet customers. These include……c. Items with low supply material availability….e. Items with parts obsolescence issues….
>
> Business Approach…For each PBL initiative, NAVICP will conduct a Business Case Analysis (BCA)…..
>
> PBL Categories…The following categories are used by NAVICP to describe the various types of PBL arrangements:…(special note the table with specific assigned capabilities or services is presented in this section along with description of each category, this information is also displayed in the body of the text of this Marketing Plan)….

The following are excerpts from – NAVICP Performance Based Logistics Business Case Analysis (BCA) Fact Sheet and are chosen because the excerpt identifies a new requirement or a further refinement of higher level requirement which will impact implementation efforts:

> For each PBL initiative, NAVICP will conduct a Business Case Analysis (BCA)…..
>
> The BCA process involves determining the Navy's current cost of doing business. This "without PBL" cost is then compared to the cost to the Navy if we execute a PBL arrangement. This "with PBL" cost includes both the PBL supplier's cost as well as residual costs the Navy will retain even under a PBL arrangement.

The foundation documents, put in place to establish the performance based contracting methodology, identify this cost focus as the primary discriminating criteria. The guidance documents, used to implement the methods, go beyond the cost criteria by adding additional caveats and restrictions, such as an "all or nothing" involvement, for functionally different but related portions of the support effort. Furthermore by dictating the allocation of certain functions to be accomplished by specific entities, the guidance documents constrain the cost focus of the foundational documents potentially yielding to sub-optimal results. The NAVICP implementation documents defines three baseline assumptions which mold the contracting environment: 1) awards a contract to a single supplier, 2) assess current in-house government activities/functions on past performance only, and 3) defines a government employee and/or activity as sub-contracting to a contractor. The singular contract requirement cannot be implemented within the Organic activities due to built-in constraints defined by the Navy's structure. In identifying this as a pivotal requirement the implementation documents define a non-competitive environment with respect to the Organic activities. The second implemented baseline assumption provides bias when performing cost comparisons. Central to the decision making process regarding the potential use of a Performance Based Logistics (PBL) contract is the development of the Business Case Analysis (BCA). The ground rules currently used in developing the baseline cost estimates for Organic support (i.e. in-house Navy support activity) uses historical performance data and compares this data with

contractor proposed estimates in evaluating cost effectiveness of the contractor's proposed cost. Important to notice is that the Organic support costs rely solely on the past data and by doing the analysis in this manner three major assumptions are made: 1) the past performance data is accurate, applied in an appropriate manner, and the data reflects current and future performance of the Organic activities/functions, 2) there are no opportunities to reduce, streamline, or improve the Organic cost figures, and 3) the Organic activities/functions would not be affected by the competitive environment. Applying historical costs to the Organic entities and comparing the cost estimates in a proposal from the contractor yields a bias in favor of the contractor. Although this type of analysis is considered to foster a competitive environment where the lowest cost gets the contract, the process side steps many of the tenets of true competition. The third baseline assumption appears to be in direct conflict with the foundational documents for functions/activities, which require the use of value judgments having long-term programmatic impacts. The implementation methods employed in developing performance based contracts handicaps the Organic activity/function, identifies no method to input into the decision-making criteria, potentially places Government employees in a position of having a "conflict of interest", provides a "non level playing field", and in no way assures the Navy receives the best possible value available in today's market place.

2. Conclusion: The Performance Based Contracting Environment

The new emphasis in the contracting environment using PBL contracting methodologies presents challenges to the Organic activity/functions with respect to implementing the SSB system. It appears evident that these challenges include: 1) a barrier to entry into the PBL contracting environment due to exclusionary policies at the contract implementation level although the upper level policies support the SSB systems concepts, 2) the current contracting methodologies establish scenarios in which there could be a "conflict of interest" for Government employees when providing sub-contracting services for a contractor, this potential could directly impact the SSB system applicability since it is performed by Organic activities/functions, and 3) no definition/designation is provided with regards to the DMSMS support function and its categorization as an "inherently Governmental function" or a commercial activity,

without such an identification there exists an amount of uncertainty about who would be performing the SSB systems functions in the future. The purpose of this section is to identify and describe the factors, which could influence the success of the SSB system in the current market place. Responses, adjustments, and/or resolution to the challenges described above will be addressed later in this Marketing Plan.

II. THE CUSTOMER ENVIRONMENT

A. WHO ARE OUR CURRENT AND POTENTIAL CUSTOMERS?

As identified in the external environmental analysis our current customers are the Navy programs who need long-term COTS supportability. Our end customer is the Program Manager (PM) who has the ultimate responsibility for the life cycle supportability for fielded products. The PM in managing this responsibility delegates much of the supportability responsibilities to a team specifically chartered for that purpose. Although the type of team can take many forms (i.e. Integrated Product Development, working group, etc.), the methods, practices, and processes used in supporting the long-term supportability strategy is a team product and, as such, the actual using customer is the support team. The support team is a cross functional group of teaming members who must identify, implement, and measure the effectiveness of the support solution alternatives. The PM has the authority and power to direct and empower the team and must also provide adequate resources for the team to function. Potential customers include other entities who face similar requirements and constraints as our current Navy customer base. Provided below is a sample list if prioritized potential groups, entities or functional areas under consideration for extending the customer base:

1) Military Branch Services:
   a. Army, Air Force, Special Forces
2) Non-Military Branch Services:
   a. Coast Guard
   b. Homeland Defense Support Entities
   c. Alphabet Soup of Governmental Entities: FBI, CIA, NSA, NASA, DOE, NOAA, USGS, DARPA, etc.
3) Industrial Segment using COTS such as:
   a. Aircraft industry
   b. Industrial Machinery (i.e. Numerically Controlled Laths)
   c. Farm Equipment
   d. Industrial Production Facilities (i.e. Assembly plants, petrochemical, etc)

B. WHAT DO OUR CUSTOMERS DO WITH OUR PRODUCTS?

The service we provide establishes relationships with the manufacturer of the COTS products, the aftermarket manufacturer – SSB supplier, the supportability planning team and the procurement functions. The customer (i.e. support team) will embed the SSB system within the overall supportability strategy, then task us to implement and monitor the effort. The long-term supportability planning for a Navy fielded system requires continuous review and updating through inserting new technology on a regular basis. The SSB system is easily adaptable for sequential reuse reducing the Life Cycle Cost (LCC) of the Navy's fielded systems.

C. WHERE DO OUR CUSTOMERS PURCHASE OUR PRODUCTS?

As with many professional services, our service satisfies a niche requirement for our customers accomplished through a teaming environment. The community of players – PM, the support team, the upper level support organizational structures (i.e. SYSCOMs, PEOs, Field Activities, etc.) – are all potential network points to match our service with the customer base. Knowing that it is this community with it's unstructured network that provides the primary mechanism through which our services get requested, it becomes evident that it is not so much the place that holds importance ('the right place at the right time') but instead it is the relationship with the community (networking) that places our service in front of the customers.

D. WHEN DO OUR CUSTOMERS PURCHASE OUR PRODUCTS?

The purchasing of our services are situational based, in that, either there is an immediate threat or emergency or as part of the established planning process. If the services are in response to an immediate threat the customers procure the required amount of service at that time and if satisfied will usually make arrangements to retain services for future issues. If our services are purchased as part of the established planning processes the customer will request a proposal for services for the next Fiscal Year (FY) around March/April time frame of each year. Next the customer will work with us to establish a Statement of Work (SOW) and a funding profile for the next Fiscal Year (FY) budget and funding process, which will come to fruition in the coming new

FY starting in October. In summary, unplanned services can be procured at any time and planned services are purchased on an annual basis at the start of the new FY.

E. WHY (AND HOW) DO OUR CUSTOMERS SELECT OUR PRODUCTS?

Our services are unique and provide attributes not found through any other methods, processes or services. Our customers select our services for the wide range of positive characteristics resulting from implementing our services, some of the major positive aspects include: 50% reduction in Life Cycle Costs (LCC) as compared to the typically employed methods, substantial reduction in supportability risk to the program, long-term relationship building, long-term business planning including – tech refresh cycles, Fleet deployment planning, supporting system equipment baselines, and inputs which allow stabilization of the Planning, Programming and Budgeting System (PPBS).

F. WHY DO POTENTIAL CUSTOMERS NOT PURCHASE OUR PRODUCTS?

The SSB system is new and is just now returning the kind of results identified above. Without a proven track record many would be customers are unwilling to take the risk and embrace the system. As we gain more implementation experience, the risk to our customers can be identified in a more concise way and eventually we will be able to win over some of these skeptical potential customers. Another reason for potential customers not purchasing our services is because of the Navy's contracting methodologies. These contracting methods exclude our participation while providing incentives to the contractor to produce less optimal support systems. The SSB system is actually accepted or rejected by a support team and as described under the "competitive environment" section of this plan, there are a host of reasons why such a team would reject the SSB system.

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III. INTERNAL (ORGANIZATIONAL) ENVIRONMENT

A. REVIEW OF THE MISSION

Our mission is to provide our customers with cost effective services and products, which address the business, technical, and management issues associated with the inherent supportability risks of COTS products in fielded systems.

B. REVIEW OF MARKETING GOALS, OBJECTIVES, AND PERFORMANCE

What are our current marketing goals and objectives?

The marketing objectives involve establishing the SSB system a unique standard practice while projecting the image as an enabler of currently used support systems that are employed during the decision-making processes regarding supportability of COTS products. The SSB system is a collaborative system in which the participants voluntarily use the system and in return receive value added products and outputs. Described another way, think of the collaborative process much in the same way you would think of a "Franchise": "Why would someone join and why would they chose to stay". One of the most important parameters in showing the utility of the SSB system will be in describing the value-add proposition and its applicability to other situations. The System Engineering approach provided through implementation of the SSB system allows us (the Navy), to leverage currently used methods and processes and yielding more robust and cost effective support systems. The projected image must be substantiated with "real life" examples of the value-added proposition results and this Marketing Plan shall illustrate these characteristics. Our current goal of 20% capture of the Navy programs translates to 72 programs or an equivalent 80 man-years per year effort, and it is estimated that this quantity of programs will establish the SSB system as one of the standard solution alternatives. It is important to understand that the SSB system is one of the potential solutions to a given solution space and the term "capture" refers to the programs funding of an analysis to evaluate the potential in implementing the SSB system which may or may not be chosen as the final alternative. In essence a program

will need to invest in the relationship building portion of the SSB system as part of a trade-off to be identified as being 'captured.'

Are our marketing goals and objectives consistent with the mission, goals, and objectives of the firm (i.e. Navy)? Are our marketing goals and objectives consistent with recent changes in the marketing or customer environments?

Unfortunately the answer is both yes and no. The Navy totally supports the value-added proposition and the measurable results captured to substantiate it, however some of the contracting policies such as PBL have unintended consequences that work in a counter productive way to this support. The risk management methods, processes, and tools implemented through the SSB system were not available when the counter productive contracting policies and practices were put into place. The inconsistencies identified here will be addressed later in the marketing plan.

How are our current marketing strategies performing in terms of sales volume, market share, profitability and communication (e.g., awareness and preference) objectives?

The SSB System's strategic direction for marketing is that of Product Leadership. Currently the SSB system is the only system developed to address proactive long-term COTS supportability without the reliance on specific design architecture. There exists some proactive design architectures such as "open systems architectures" which allow for very quick change out of one COTS item for another without major design changes. However the limitations in using this approach is that it must be instantiated upfront in the design of the system and the approach does not apply to all possible cases. The SSB system has unique characteristics that allow application to most systems independent of design and allow the Program Manager (PM) to choose the length of support, for example length of time between tech refreshes. Using this Product Leadership strategy in the early marketing stages we have captured 4 programs or .01% of all programs and with respect to our goal of 72 programs or the equivalent of 5.5% of the goal. These programs are leading edge thinkers identified as "innovators" and are willing to take the risk in using a new and novel approach. From these first few programs we have gathered the data and metrics to show in a Business Case Analysis (BCA) the value-added proposition provided by the system. The position strategy of Product Leader may always be part of

the SSB system marketing approach, however once the 20% goal is reached and the system is considered as one of the standard methods, competition will emerge, such that, in order to grow our market share we will need to adjust. The strategic direction we believe will slowly shift from Product Leader to Customer Intimacy where our personnel's direct involvement with the programs and the continuous name recognition of "SSB" will provide a branding regarding proactive long-term COTS supportability. An inherent characteristic of the SSB system is that the more inputs or business added to the core database, the greater utility the system becomes at solving new customers issues. For example the first four programs had only a few COTS configurations, which overlapped programs or OEMs. The next programs may find that when having their COTS configuration list checked against the current database perhaps we will see a 10% overlap, whereby the 10% represents the amount of work that has already been accomplished. This percent overlap will continue to rise as workload increases over time so that each new program gains leverage from all previous implemented programs. The more the Navy uses the SSB system the more there is to be gained by the Navy in both short and long-term support of its programs. As part of the initial System Architecture the SSB system is structured to perform many of its data review and evaluations using computer programs to accomplish these repetitive time consuming task then automatically generate a menu driven reporting system. For the first few programs the data manipulation, review, evaluation, and reporting functions were accomplished by hand, although a computer program is being developed based on this initial data input. This automation combined with the expected growth of the system will produce efficiencies that may allow us to pursue a marketing strategy of Operational Excellence. This type of strategy may be reviewed only after the computer based system is mature and the market forces are requiring us to change our strategic approach. Using our initial strategy as a Product Leader the response from our potential customer base has been outstanding. Several calls each week for more information and request for proposals, have been coming in at a constant rate. The draw seems to be the novel approach in an area with no or few other choices. The method of communication yielding this type of response is a product of two different delivery methods: conference presentations and

word of mouth. The split between the two types is about 40/60 – conference presentations to word of mouth.

How does our current performance compare to other firms in the industry? Is the performance of the industry as a whole improving or declining? Why?

The entire industry catering to the DMSMS market is in a growth mode partially due to the increased content of COTS products in the fielded DoD systems and also due to the life extension to many of the major combat weapon systems. The interest in our products and services appears to have a larger increase with other players in the industry than the Organic participants. We believe that this is primarily due to the unique attributes of our services and products because the type of inquires we have received thus far.

If our performance is improving, what actions can we take to ensure that our performance continues to improve? Is the improvement in performance due to a better than anticipated environment or superior planning and implementation?

The next phase of our System Engineering Development and Implementation (SEDI) Plan is to publish the results of the first 3 programs implementation results. This phase, as planned, is currently underway and results will be released concurrent with the release of this Marketing Plan. The impact to the marketing effort will be significant because the Business Case Analysis (BCA), using real data, has shown the benefit to the program accompanied by a well defined path for implementation. The SSB system will sell itself on its own merits if given a fair and open competitive environment. We have already received requests from several program representatives to let them know immediately where they could get the data once released. Continuous reporting on initial performance will further improve our market position. Continuous improvements are expected because, they were driven by design, structure, planning, and feedback from the implementation efforts.

C. REVIEW OF CURRENT AND ANTICIPATED RESOURCES

What is the state of our current organizational resources (e.g., financial, capital, human, experience, relationships with key suppliers or customers)? Are these resources likely to

change for the better or worse in the near future? If the changes are for the better, how can we utilize these added resources to our advantage in meeting customer needs better than competitors?

The SSB system as currently implemented is a pay-as-you-go type financial arrangement. A program is solicited that has an immediate need for support appropriate to the SSB system's attributes. The funding is then allocated by the program for the SSB support for the next Fiscal Year (FY), if the need arises mid year the programs have short term funding mechanisms to receive help immediately. Although the SSB system is capable of helping in the short term the strategic focus and use of the system is long-term support, therefore short term projects are looked at as a marketing tool, in that we are able to "get our foot in the door" to demonstrate the utility of the system. The capital needed to provide our services is minimal, a server and work stations, and most are already in place and local management allocate these resources to the SSB effort with the expectation of growing the business. There are two primary resources needed for support and growth of the SSB efforts: experienced personnel and development of close relationships with the supply base (OEMs and SSB suppliers). The SEDI plan was conceived and implemented with the idea of using the implementation efforts as a training mechanism to provide on-the-job (OJT) for existing personnel resources to expand their experience base to include the SSB system's methods, processes, and tools. Currently there are five experienced engineers already capable of implementing the SSB system and four more slated for training. Additionally the SEDI plan has been prepared to be used as a prescriptive document in which a senior engineer could take the information and by applying the appropriate skills, implement the SSB system with some trial and error efforts. Even if independent implementation efforts are initiated, central to the success of the efforts will be the leverage available from previous work. The database that was established for the SSB system contains valuable information that, when used will lessen the work load for a new program implementation effort and provide a track record of success to "springboard' the new effort. Captured within the database are the established relationships that have been set up with the supply base, described either to the level identifying the suppliers or further delineating the exact configuration item already analyzed in support of another program. Initially no

information existed but after implementing on just four programs over 40 supplier relationships have been defined and the individual number of configurations covers over 130. It is expected on the next program about 10% of the existing data will be reusable and the following added program will benefit by as much as 15% reuse. Eventually a new program added to the existing database may have as much as, 50% coverage due to reuse. Following this logical progression, it is clear to see that the more the Navy uses the SSB system the more leverage it gains and that additional usage will provide even greater utility through use of the system.

D. REVIEW OF CURRENT AND ANTICIPATED CULTURAL AND STRUCTURAL ISSUES

What are the positive and negative aspects of the current and anticipated culture of the firm?

The Navy as compared to other branch services is most willing to allow a new idea on the basis that the oversight rules and regulations do not restrict it, whereas other service branches take the approach that unless the rules and regulations specifically allow the addition of a new idea then it is not allowed. This allowance of the Navy to experiment with new ideas provides an excellent environment to initiate the SSB system. However notwithstanding this freedom the Navy Program Management Offices (PMO) are conservative and have a tendency to lean on past experience with available products/processes instead of jumping on a new way to do business. The two factors that seem to be the deciding factors for the PMOs is impact on the bottom line and the reduction of risk to the program. The SSB system excels at influencing both of these factors and therefore the culture works in our favor.

What issues related to internal politics and power struggles might affect our marketing activities?

The single largest issue, as identified above, is the position NAVICP has taken with their contracting policies that excludes Organic activities from providing DMSMS support in the primary contracting method, PBL. Without the support of NAVICP in allowing the SSB system (an Organic function accomplished by an Organic activity) does not keep the SSB system from being implemented but will require SSB system to be

marketed to the individual PMO organizations. Conversely, if NAVICP endorsed the use of the SSB system they could use their centralized position in the Navy as an effective advertisement method to enable the SSB efforts. The marketing situation as it is currently will necessitate us to approach each of the 365 different PMOs with the SSB potential so that at the PMOs direction NAVICP must not contract away the DMSMS functions. Although this last alternative is the least attractive it may be the only method to implement the SSB system within the current Navy structure.

What is the overall position and importance of the marketing function as seen by other functional areas?

In the DoD environment, marketing functions are relatively new and are looked upon with skepticism and mistrust. Historically the marketing duties were additional duties accomplished by the upper level management in the typical personal marketing approach. Over the past few years (e.g., 5-10 years) independent non-coordinated marketing endeavors attempted to promote certain Organic activities and/or functions. However at the working level, in many cases the decision level, modern marketing methods and practices are usually frowned upon and instead the personal contacts, political affiliations, the reputation, past involvement, and past performance are the preferred credentials to be used as marketing approaches. It is important to understand this mindset when developing a marketing plan so that in introducing new marketing practices, they should be blended with at least some of the acceptance criteria required by the focus audience.

Are key executive positions expected to change in the future?

The Navy like all the other branch services has as a normal turn over in top military management approximately every 2 years and depending on the upper level policies, economic environment, and top level strategies the impact of the change will depend on the new management and their agenda. The Federal Civil Servant management, on the other hand, is typically long lived and maintains the corporate knowledge and know-how to enable the PMO function. There seems to be no expectations of change at the civilian management levels that would be key in impacting the SSB system, however the current downsizing efforts at the upper level PMO located

in the central office in the D.C area may have a dramatic affect. This downsizing could bring about two different impacts to the SSB system efforts: 1) acquiesce to the NAVICP PBL implementation plans since it is an easy path to offload the work that the PMOs no longer have the staff to handle, or 2) be more open to allowing a new method used by an Organic activity to perform functions previously held by PMO personnel, keeping the function in-house although at a distance.

How will the overall customer orientation of the firm (or lack thereof) affect our marketing activities?

As described earlier, the using customers are the PMO support teams and the metrics, which guide their decisions are, by design, in alignment with the goals, objectives, and attributes provided through the use of the SSB system. The positive impact the SSB system will have on Life Cycle Cost (LCC) and obsolescence risk reductions will open the door for our marketing activities.

Does the firm emphasize a long-term or short-term planning horizon?

Although the Navy in general emphasizes long-term relationships and planning horizons, the way in which these long-term attributes are assessed uses short-term metrics, such as the funding and manning level goals of the current year and cutting or curtailing functions to meet this FY goals with little regard for impact on future years. Since the SSB system provides the best bottom line for the current year along with the long-term horizon optimization both end effect and immediate needs can be met.

How will this emphasis affect our marketing activities?

The Business Case Analysis (BCA) should take center stage when introducing the SSB system's concepts so as to open the door for other marketing opportunities. Over time the track record on successful implementations and documented customer satisfaction will add some assurances to the PMO regarding the perceived risk of implementing the SSB system.

Currently, are there positive or negative issues with respect to motivating our employees, especially those in customer contact positions (e.g., sales, customer service)?

Currently the SSB system implementation efforts are carried out in an Integrated Product Teaming (IPT) environment, which has fostered a sense of ownership and interest with the employees. Every employee knows that by implementing the SSB system they are helping solve one of the largest, most costly problems with the fielded systems. Motivation among the employees is high at this initial introduction level but over time it is expected that as the effort appears to become more of a day-to-day job instead of this great opportunity and challenge, that motivation may be a future problem.

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IV. SWOT ANALYSIS FOR THE SSB SYSTEM

A. STRENGTHS

Strength 1: The SSB system provides expandable, transportable and Life Cycle Cost (LCC) reducing processes, methods, and tools.

How does this strength assist in meeting customer need?

The expandable characteristic of the SSB system allows it to be applicable to most any program regardless of size. This scalability ensures that the SSB system will be able to keep pace with a program's growth and the addition of other COTS products as the program's system is modernized. The transportability feature addresses the issue of long-term support of the SSB system itself so if it was no longer viable to receive services from the current Organic activity providing the service then at the program's option the support function could be moved to another activity. Simply stated this feature assures the longevity of the SSB systems support. The LCC reductions possible due to the implementation of the SSB system is the strongest driver or draw by the PMO for the SSB system being employed. These reductions are one of the most unique characteristics of the SSB system and a clear differentiating attribute which impacts one of the most prominent metrics the PMO's success is judged against, Life Cycle Cost. The documented processes, methods, and tools provide assurances to the customer that the service received through implementing the SSB system is repeatable, continuous, and reliable. These documented practices have been delineated in the Systems Engineering Development and Implementation (SEDI) Plan with detailed examples, instructions, templates, processes, etc. which can be immediately implemented.

How does this strength compare to our competitor's strengths? Does this Strength make us different from (better than) our competitors in the minds of our customers?

The SSB system provides an additional alternative to the PMOs in resolving obsolescence issues, however it differs from the dozen or so point solutions currently available in three distinct ways: 1) the collaborative architecture necessitates the use of close partnerships with the supply base and includes these entities in the resolution process and in the business planning, 2) the Systems Engineering approach embedded

within the SSB system optimizes on the LCC and long-term support providing a structure spanning all functional disciplines life cycle elements - this allows other point solutions to be incorporated where appropriate to achieve maximum utility, and 3) the SSB system when used at the appropriate time yields the lowest LCC and best value risk management process for COTS products. All three of these attributes impact the program's ability to provide long-term support of COTS products and are reflected in the evaluation criteria used in assessing the PMO's accomplishments, as viewed from their sponsors.

Strength 2: The SSB system provides new supportability options to the PMOs.

How does this strength assist in meeting customer need?

The SSB system reduces the amount of program investment, extends the repair/depot support, and establishes methods to reduce the mean logistic delay time for supplier supported COTS products. The investment the program would need to make to cover the spares required over the supportability period will be drastically different when using the SSB system's methods and processes, as compared to usual method of support of Life Time Buy (LTB) option. As an example, consider a $6,000.00 COTS assembly used in the fielded systems which requires 100 spares to be bought for life cycle support of 10 years. This particular assembly is going obsolete due to two chips on the assembly with a total cost of $200.00 per assembly. Without the SSB system and using the LTB option instead, the immediate cost to the program would be ($6,000.00)*(100) or $600,000.00. Conversely by employing the SSB system the resulting immediate cost to support the program would be ($200.00)*(100) or $20,000.00 + Non-Reoccurring Engineering Cost (if applicable.) When an aggregate of cost over all COTS products on a given program/system is rolled up, to quantify the immediate cost to the program the amount is usually staggering. The SSB system support allows the PMO to meet budgetary constraints while providing long-term supportability requirements. The close partnership with the supply base provides insight into not only the obsolescence issues but also gives the Navy the chance to negotiate for long-term supplier support of fielded products for repair and maintenance. The experience gained during the implementation of the SSB system on three programs showed that every SSB participant was capable and willing to perform these needed depot functions. The relationship building accomplished

as part of the SSB implementation process also addressed another Fleet need that the suppliers would be capable and willing to help with which is quick turnaround times for field returns. Many of the suppliers are willing to keep a spare COTS item on their shelf to replace immediately a Fleet returned unit, this could bring the turnaround time to days instead of weeks or months.

How does this strength compare to our competitor's strengths? Does this Strength make us different from (better than) our competitors in the minds of our customers?

The SSB system is the only alternative that institutionalizes the Navy-supplier partnerships through a well defined infrastructure and set of implementation tools. As part of the process the PMO (customer) defines the supportability boundary criteria such as how many years does the fielded system require support till the next tech refresh activity. Only the SSB system allows the customer to choose the length of support desired, all other support methods are reactive and as such require the program to react with a point solution constraining the possible alternatives and associated time elements. The structures set in place by the SSB system provides additional opportunities for the PMO to perform business planning such as PPBS, funding allocations, and equipment install scheduling. The System Engineering approach inherent in the SSB system provides these added benefits, which are not available through the use of point solutions.

Strength 3: The SSB system provides a proactive COTS obsolescence risk management process.

How does this strength assist in meeting customer need?

The customer has a need to support fielded systems for extended periods of no less than 5 years but support could be required up to 15-20 years. Since COTS products generally have life spans of 2-5 years after which supportability is not an option without some type of intervention. The SSB system is a planned intervention that is based on the support needs as identified by the customer. The partnering and information sharing between the supply base and the Navy, provides insight to previously undisclosed potential obsolescence risks of COTS products. Combining this new knowledge with the SSB infrastructures yields the risk management methods, processes, and tools for use by the PMO to proactively address the inherent COTS risk issues.

How does this strength compare to our competitor's strengths? Does this Strength make us different from (better than) our competitors in the minds of our customers?

The SSB system was specifically designed to be the first alternative containing architectural elements capable of addressing the risk issues involved with COTS products. The key to success in managing this risk is the use of a systemic, broad based, life cycle approach to deal with the entire fielded system. These key elements are absent when using the point solution approach employed by the other alternatives. The SSB system is the only practice, known to the authors, which provides opportunities to the customer to address risks previously identified as large and open-ended programmatic risks.

Strength 4: The SSB system provides the infrastructure to enable Business planning and Management system for fielded system containing COTS products.

How does this strength assist in meeting customer need?

Management of fielded systems containing COTS products has historically been a very difficult and unsuccessful venture for PMOs. Several characteristics of the COTS products compound the management efforts and make it exceedingly difficult to maintain control over these products, the major exacerbating attributes are: 1) the OEM controls the configuration of the product and may change it without notice, 2) the rate of change of the COTS products is measured in months (i.e. < 18-24 months product life cycle) whereas Fleet installation is measured in years, and 3) many COTS products do not have long-term support available. The SSB system was specifically designed to address these issues – "head on" – with methods to gain the configuration knowledge and potentially freeze that configuration if needed, and finally the issue of long-term support and obsolescence management is addressed through processes and tools embedded within the system. As an emergent new property of the SSB system due to the long-term planning and holistic view taken, the knowledge gained regarding the fielded system identifies the input data necessary to perform long-term business planning such as: estimated spares required each year of support, an estimated dollar value needed each year to extend the COTS life cycle, the total amount of proposed budgetary requirements. The SSB system

provides the first system, which yields this type of knowledge that is based on justifiable detailed information used in predicting the estimates.

How does this strength compare to our competitor's strengths? Does this Strength make us different from (better than) our competitors in the minds of our customers?

With the designed-in and emergent properties of the SSB system the PMO (customer) can now control, manage, and plan the physical support of the hardware along with the business support (i.e. the PPBS, resource allocations). No point solution alternatives can produce these systemic characteristics and the PMOs have been requesting such a solution with no implementable practices identified until the SSB system was introduced.

B. WEAKNESSES

Weakness 1: The SSB system is a new system with a very small track record.

How does this weakness hinder us in meeting customer needs?

The first issue that emerges due to this low level of implementation of the SSB system is a concern that, regardless of the outcome of the first implementation efforts, has the system been adequately tested out and found capable for every or most every application. Like any new system - performance over time - will be the arbitrator for the inclusion and growth of the SSB system. The lack of long standing track record will impact the acceptance of the system by well established support teams, who are typically conservative and slow to incorporate new approaches.

How does this weakness compare to our competitors' weaknesses? Does the weakness make us different from (worse than) our competitors in the minds of our customers?

Although the point solution alternatives lack many desirable characteristics obtained through the use of the SSB system, the point solutions have been used to support the existing fielded systems and therefore have a proven track record and an expected outcome. A PMO or their support team will need to perform a trade-off analysis with regards to comparing existing methods and solution alternatives with the SSB system's attributes. Depending on what criteria is used and who is making the decisions, the SSB system may or may not be considered as a potential alternative. Possible roadblocks and

constraints are described in the "Competitive Forces" section of this plan and provide insights to the motivation behind some group or person wanting to exploit this weakness.

Weakness 2: The SSB system necessitates the up-front PMO support and a long-term commitment on behalf of the PMO and the support team.

How does this weakness hinder us in meeting customer needs?

The SSB system is built on a collaborative architecture that necessitates the voluntarily participation of its members. As with most proactive methodologies the SSB system requires some up-front investment to initiate any kind of return. Typically before the PMO will invest in a potential alternative they will want to know what kind of return can be expected and what kind of risk they are taking. Compared to point solution alternatives, which are usually singular events, the SSB system requires continuous support over the life cycle of the fielded COTS products, in essence locking the PMO into a long-term commitment. Both the up-front support and the long-term commitment present the PMO with a potential risk to the program with respect to funding and technical support issues.

How does this weakness compare to our competitors' weaknesses? Does the weakness make us different from (worse than) our competitors in the minds of our customers?

The PMO or their support team will need to perform a trade-off study, formally or informally, to identify the cost-benefit comparison in using or not using the SSB system on their specific program. The approach taken in performing the trade-off study will be reflective of the outcome. If the approach focuses mostly on the short-term results with little attention paid to the long-term outcome, then a point solution alternative may look the most promising. However if the long-term view is taken and the focus is on LCC and reducing programmatic risk the most probable outcome will be implementing the SSB system.

Weakness 3: The SSB system is not part of the mainstream contracting process implemented by NAVICP.

How does this weakness hinder us in meeting customer needs?

When a PMO tasks NAVICP to contract for the program support functions, any Organic activity providing DMSMS/obsolescence support functions are specifically

excluded from participating in the contracting process -- this exclusionary policy includes the SSB system. Unless the PMO has an awareness of the situation and interjects the desire to pursue the SSB system specifically, the SSB system will not even receive consideration as a possible alternative. As identified earlier under the section labeled – “The Performance Based Contracting Environment” – the implementation policies and guidelines imposed by NAVICP do not allow a competitive environment with a level playing field and constrain Organic activities potential involvement to one in which places the government employee in a “conflict of interest” position. These exclusionary policies directly hinder the PMO access to the SSB system and provide a contracting situation in which the Navy does not have the potential to receive the “best value” for services under contract.

How does this weakness compare to our competitors' weaknesses? Does the weakness make us different from (worse than) our competitors in the minds of our customers?

In the analysis thus far, various solution alternatives were compared to each other in competing for resources, however with the exclusion of all potential alternatives except as deemed appropriate by NAVICP the situation shifts the argument. If the PMO tasks NAVICP to contract for the support functions, no competitive environment exists and no consideration can be made by the PMO regarding the utility and cost effectiveness of the SSB system.

Weakness 4: Implementation of the SSB system will require a cultural shift from an independent competitive environment to a collaborative interdependency of diverse functional groups.

How does this weakness hinder us in meeting customer needs?

The PMO support teams that have already been established to take of the DMSMS issues and are quite diverse with respect to the teaming methodology and have developed their current culture. Many of these teams use working group techniques where work is accomplished off line in functional silos then brought to the team for approval expecting only minor changes. Some of the support teams accomplish their work as an IPT and leverage the cross functional aspects of the group. Sometimes the PMO support comes from independent functional silos that have little use for the teaming atmosphere. The variations of the support efforts are to numerous to mention although

there seems to be an underlying base assumption that all activities and/or functions are vying for the same resource pool of funding. The SSB system, to be successful, must foster an atmosphere of a “win-win” scenario and stay away from the “zero sum game” so prevalent in funding resource struggles. The SSB system will need inputs from and provide outputs to, almost every function on the support team and therefore the interdependency relationships need to be established and matured. The lack of a SSB system friendly environment does not spell out failure for the system but such an environment will impede implementation progress and constrain the potential benefits from the system.

How does this weakness compare to our competitors’ weaknesses? Does the weakness make us different from (worse than) our competitors in the minds of our customers?

The comparison between, the way support teams currently do business and the practices used in the SSB system will be evident over time and will be unique to each team. The implementation of the SSB system will require a certain amount of cooperation and adjustment but these changes are usually possible within most established group’s established cultural norms. From the perspective of the customer, the cultural shift is more of a challenge that should be eventually overcome instead of a “better or worse” attribute.

C. OPPORTUNITIES

Opportunity 1: Meeting the PMO objectives in providing Life Cycle Cost (LCC) reductions of 50% or more on all systems.

How is this opportunity related to serving the needs of our customer?

The LCC is one of the primary evaluation criteria placed on the PMO during their annual and semiannual reviews. One of the biggest issues the PMO faces when quantifying the LCC is in defining the parameters that need to be measured and tracked. The structure of the SSB system encapsulates these metrics into a reporting system that keeps the PMO abreast of the projected and actual costs incurred by the program with the added benefit of incorporating other non-SSB point solutions. In this way the PMO has an oversight view regarding the true cost of support of the programs systems.

What actions can we take to capitalize on this opportunity in the short term?

With the results of the three pilot programs available to us, we can take these results and draw comparisons with other target programs, which have shown interest. The three example programs were specifically chosen because each represents a specific part of the developmental cycle such as: the AN/ASQ-20X Sonar Mine Detecting Set program is just finishing the Engineering and Manufacturing Development (E&MD) phase, the SSDS MK 2 is in the Production phase with less than one eighth of the projected units fielded, the SSDS MK 1 is considered a legacy system with 17 fielded system that need to be supported, as is, for the next 10 years. The most complete data set we have compiled, at the time this paper was written is for the SSDS MK 1 systems although the data for the other system is still being compiled and so far seem to reflect the same type of LCC reductions as experienced with the MK 1 systems. With this implementation experience we can capitalize on the fact that we can address programs regardless of where in the developmental life cycle they are and we can use the captured MK 1 data set to show expected reductions in LCC.

Opportunity 2: The SSB system defines pro-active risk management methods for COTS products that provide the Fleet user with the assurance that their system will be supportable over time and available when needed.

How is this opportunity related to serving the needs of our customer?

Risk management like LCC is an evaluation criteria for the PMO and carries considerable weight with their resource sponsors in obtaining and keeping their funding allocations. The SSB system is the only post design pro-active method, known to the authors, that is capable of yielding a quantifiable COTS obsolescence risk management method. The SSB system identifies the current risk state and a projected risk state in a measurable fashion so that it can be tracked and trended. These metrics can then be used by the PMO as objective evidence in justification of the funding allocations.

What actions can we take to capitalize on this opportunity in the short term?

Since the risk management methods are an inherent part of the SSB system and reflected in the reporting processes and tools, a direct analogy can be made with any new potential program and the three programs successfully implemented. The reporting

products used on the three programs are by design simple graphical representations so they can be readily identifiable by the PMO representatives. To gain the most leverage out of the work already accomplished, the previously prepared risk reports will be briefed to any new potential candidate programs making a direct comparison between the benefits received by the previous program and the candidate program. Additionally there are various oversight groups who have, on behalf of the program's sponsor, evaluated the risk management aspects provided by the SSB system and reported their findings up the ladder to the resource sponsor. All such oversight reports have been positive to very positive with regards to the processes and methods used when implementing the SSB system as a risk reduction and management method.

Opportunity 3: Growth and maturity of the SSB system provides greater opportunity for other Navy programs to leverage this unique internal resource expanding its value proposition to the Navy.

How is this opportunity related to serving the needs of our customer?

The first programs that supported the implementation of the SSB system had no previous work to leverage from and therefore needed to pay for each relationship building effort and every configuration assessment. However with over 40 OEM relationships established and analysis of over 130 configurations, the next programs to implement will more than likely use a portion of the previous efforts. The expectation is that over the next 5-7 program implementations, the amount of reuse of previous work may be as much as 10-15% of the total effort. The implementation efforts which follow are expected to have an increased percent of reuse perhaps eventually yielding as much as 50% reuse in later implementation efforts. As the SSB system is used, implemented, and matured the utility the programs receive from it will increase and the programs sponsors will look favorably upon the use of the system since it was their resources that are being reused instead of being spent on efforts which "reinvent the wheel".

What actions can we take to capitalize on this opportunity in the short term?

The actions that are being taken to exploit this reuse characteristic of the SSB system is to make available the list of OEM participants and the specific configurations that the SSB system was implemented on. On a personal sell level we use the current listing as an example of the potential out come, then identify if any of the configurations

appearing on the list or OEM names on the list are a match to the new potential candidate system. If an exact configuration match takes place, we offer to share the obsolescence risk analysis with the new program. If further interest is apparent and the program is willing to engage further analysis, we could work with program representatives to prepare a risk mitigation report specific to the program's needs (i.e. part number obsolete, how many parts per assembly, how many assemblies per new system, how many new systems, how long is the expected support window, etc.) A quick demonstration of the SSB systems capabilities will illustrate to the program the real utility of the information and the subsequent knowledge gained through its use. In order to reach a large or mass audience with this information, we have near term plans to post the information on a web site used by our target audience. The GIDEP (Government Industry Data Exchange Program) web site(www.gidep.gov) has over 1,500 membership organizations boasting a user pool of over 4,500 individual users. During the MIL-Spec era before Acquisition Reform, membership in this system was one of the acquisition requirements for all Navy programs and their prime contractors, therefore most of our potential new program candidates will have access to this system. The GIDEP organization has agreed to host a list of OEM participants and the specific configurations contained in the current SSB system active participation lists. All presentation materials and future announcements will subsequently be updated to reflect this reference whereby it can be tapped as a ready reference.

Opportunity 4: The SSB system employees several simulation and modeling tools to optimize the business planning and future support requirements for fielded program systems.

How is this opportunity related to serving the needs of our customer?

As part of the implementation effort regarding the SSB system, detailed resource and procurement models were prepared for the SSDS MK 1 system from which various scenarios can be simulated iteratively and recursively showing the possible outcomes. It can easily be demonstrated that the structure of these tools allows modification and customization to be applicable to most any program. Furthermore the results of running the various models using the SSDS MK 1 data provides a stunning real life example of the positive results attainable through SSB system implementation. To the authors

knowledge, no other system or method has identified a method to work within the PPBS funding system to support an overarching DMSMS support system. These models are tailored to reflect the requirements of the PPBS system such that the outputs from the models could be directly transferred to the Funding Allocation Request (FAR) an input to the PPBS system. The procurement models identify, within the constraints levied by the program, the expected level of support with regards to the hardware for each year of support. These levels are predicted based on the actual failure rate exhibited in the fleet. The resource modeling is accomplished using the NSWC Crane cost model, which takes into account all the various aspects of implementing an Engineering Change Proposal (ECP). This model covers over 128 functions/activities and is tailored to meet the needs of the application under consideration. Between these two models and a few other tools used in the SSB system, the program can get the "Big Picture" view of the supportability requirements for their program.

What actions can we take to capitalize on this opportunity in the short term?

Every program has a requirement to substantiate and justify their business planning (funding and allocation), support strategy, and risk management efforts. The knowledge of these requirements and the inherent capabilities of the SSB system which are designed into the system to meet the program needs and this information must be communicated when presenting the system to a candidate program. Again, the use of the SSDS MK1 data set in the models then running simulations structured around the constraints of the candidate program can be an illustrative and convincing tool. These simulations can be run quickly providing immediate results to show the new candidate program that the constraints presented by their program can fit within the modeling structure. Showing the applicability of the tool and methods within the confines of the candidate program will provide them some assurance of potential success. The confidence gained through these demonstrations may be enough to bridge the gap and provide a comfort level great enough to make the up-front commitment and provide adequate resources to implement the SSB system on their program.

Opportunity 5: The Naval Audit Service (NAS) has recently released reports indicating that the implementation of the Contractor Logistic Support (CLS) contracting methodologies used by NAVSEA and SPAWAR lacks adequate visibility and metrics that would assure proper oversight.

How is this opportunity related to serving the needs of our customer?

The NAS report numbers N2002-0049 [20) NAS NAVSEA] and N2002-0069 [21) NAS SPAWAR] both identify a lack of a performance plan, strategy, or management control to implement the CLS acquisition reform initiative by NAVSEA and SPAWAR respectively. The lack of controls and measurements to achieve the desired results of reduced cost and improve system availability was identified as an inadequacy in Program Management. CLS can and many times does take into account the DMSMS support functions usually in the form of Performance Based Logistics (PBL) contracting methods. As discussed earlier in this plan, PBL contracting methods do not provide the most advantageous environment for the Organic field activities participation including the use of the SSB system. Both SYSCOMs (NAVSEA & SPAWAR) need to develop reporting and management structures to overcome the identified shortcomings.

What actions can we take to capitalize on this opportunity in the short term?

The BCA prepared in support of the SSB system in conjunction with the reporting mechanisms inherent to the SSB system will meet these shortcomings reported by NAS. The reporting and management structures needed by the SYSCOMs, have already been set up and are functioning for COTS supportability, available only if the programs choose to implement the SSB system. The SYSCOMs management and the Program Managers need to be informed of the availability of the SSB system in order to leverage the currently available assets. This additional attribute of the SSB system should be announced at the same time we communicate the potential negative impacts when CLS or PBL are implemented through NAVICP using their exclusionary implementation practices.

Opportunity 6: In early September 2002 Secretary of Defense office rescinded the existing DoD 5000 series documents with a memo that stated, the identified hard requirements – the "must do" – Systems Engineering methods will be replaced by a guidance document to provide more leeway to the Program Managers.

How is this opportunity related to serving the needs of our customer?

The removal of requirements documents relaxes the discipline required by the implemented processes and inevitably produces larger risks to the Program Manager (PM) and the acquisition process. To be successful in a requirements poor environment the PM must institute risk management methods and practices to maintain control or at least visibility into the program activities. With this new change of direction from DoD the need for the risk management disciplines increases dramatically and must be instituted on a continuous ongoing basis. The SSB System is a risk management method for COTS products.

What actions can we take to capitalize on this opportunity in the short term?

The communications with the customer base should identify the obsolescence risk management attributes of the SSB system and how these attributes provide the PM with the visibility into the program activities. One of the keys to illustrating the utility of the system will be in displaying reporting products from previously assessed COTS products on other programs especially if they are also used on the PMs' equipment. The continuous and all encompassing insight provided through the reporting mechanisms as part of the SSB system are packaged and tailored to meet the needs of the program.

D. THREATS

Threat 1: Current contracting implementation policy regarding Performance Based Contracting (PBC) may curtail or eliminate the possibility of using the SSB system.

How is this threat related to serving the needs of our customer?

As identified in the preceding material, the implementation policies of NAVICP can preemptively exclude the participation of all Organic activities and therefore exclude the SSB system. The PMO may unknowingly task NAVICP to subcontract out the DMSMS support functions believing that the "best value" for their program will result from a competitive environment. As discussed in detail, NAVICP does not provide a

competitive environment nor do their processes assure "best value", therefore without prior knowledge of the contracting environment or intimate knowledge of the capabilities of the SSB system the programs may never know of these shortcomings.

What actions can we take to prevent this threat from limiting our capabilities in the short term and in the long term?

NAVICP's exclusionary policies are either: 1) an unintended consequence of their goal to streamline their processes, or 2) intended to streamline and optimize their internal processes while in the bigger picture does/may not provide the Navy with the "best value". Regardless of the reason for or logic behind these policies, the impact of them needs to addressed. A three pronged approach is recommended in dealing with the current situation: 1) address NAVICP directly through a set of meeting with the decision makers to illustrate the impacts of the policies and show bottom line figures from implemented examples of the SSB system and show what the Navy is missing out on because of their policies, hopefully resulting in a change in policy direction, 2) since it has been shown that their policies are in conflict with the guidance documents and executive mandates, that a request for clarification be sent to Secretary of the Navy, Advocate for Competitive Environment and have NAVICP implementation policies reviewed for adequacy and possible revision, and 3) develop a mass broadcast to all PMO and provide them with intimate knowledge of the SSB system and specifically highlight the shortcomings of the NAVICP implementation policies. All three of these approaches are being undertaken at this time. With the completion of the Business Case Analysis (BCA) as a result of the SSB system implementation process for SSDS MK 1, we will have accurate real data to prove the viability of the SSB alternative and with that data we can approach NAVICP with a supportable and justifiable case in point. A set of clarification questions have been prepared and is being sent to the point of contact in the SECNAV office to review our interpretations of the cause and affect impacts due to the NAVICP implementation policies. Articles are being prepared for three separate publications well read by our target audience:

1) The COTS Journal,
2) Defense Acquisition University (DAU) – Acquisition Review Quarterly, and
3) Defense Acquisition University – Program Manager, PM Magazine.

Additionally the following conferences and workshops have been or will be presenting the SSB system during the event and contained as part of the proceedings:

1) 2002 GIDEP Workshop and Information Sharing Conference, May 24-16, 2002, San Diego, CA.
2) 2002 International Military & Aerospace/Avionics COTS Conference, Exhibition & Seminar, San Diego, CA.
3) Naval-Industry R&D Partnership Conference, Sponsored by Office of Naval Research, August 13-14, 2002, Washington D.C.
4) Government Industry Association (GIA) Conference, September 10-11, Kent, WA.
5) National Defense Industrial Association (NDIA), 5th Annual Systems Engineering Conference, October 21-24, Tampa, FL.
6) NAVSEA COTS Steering Board Workshop 2002, October 30-31, Laurel, MD,
7) The 7th International Commercialization of Military and Space Electronics Conference & Exhibition (CMSE), February 10-13, 2003, Los Angeles, CA.

Of these seven conferences/workshops, all have confirmed acceptance of submitted abstract and materials with the exception of the last entry #7. With regard to the long term mitigation of this threat, our plans are to: 1) Institutionalize the SSB system as a standard alternative by updating the DAU publication – Program Managers Handbook – to reflect the SSB system as the preferred practice, 2) keep vigilant with regard to the DMSMS community by providing presentations at future conferences/workshops, 3) provide face to face presentations to as many programs as possible, thus far over a dozen such presentations have been given, 4) present to the Program Executive Offices (PEOs) and resource sponsors showing the bottom line benefits to get a top down endorsement/sponsorship.

Threat 2: Subcontracting government DMSMS support personnel to contractors creates a "conflict of interest" situation for the government employee while yielding sub optimal results for the Navy.

How is this threat related to serving the needs of our customer?

The primary purpose in implementing the SSB system is to provide the "best value" to the Navy through defining a process yielding manageable risk at the lowest LCC. If a "conflict of interest" situation exists either within the contractor - the bottom line versus "best value" for the Navy – or with the government employee trying to

balance the requirements of – their employer directives versus "best value" for the Navy – the lack of independence of DMSMS support function will most likely produce sub optimal results for the Navy. Since the NAVICP implementation policies have no counter acting force or "change agent" activists, contracting out this vital function appears inevitable. Over time the internal Organic activities will become either the willing participants of the contractor's directives or a non-participant whereby the internal Navy resources for DMSMS support will eventually disappear. In the end the PMO (customer) will receive DMSMS support that will reflect the contractor's – "best bottom line" – versus the Navy's – "best value".

What actions can we take to prevent this threat from limiting our capabilities in the short term and in the long term?

The same action plan identified for Threat 1 is applicable with regard to the "conflict of interest" issues although a few actions will require modification. With a "conflict of interest" problem the issues take on more of a political overtone versus the straight business implications in arriving at the "best value" for the Navy, as identified in Threat 1. Therefore it is important to work this issue in a low-key fashion up the chain of command instead of broadcasting it at every conference and workshop. The preventative actions to mitigate this threat are to confront NAVICP directly and request interpretation and action from SECNAV.

<table>
<tr><th colspan="2">THE SWOT MATRIX FOR THE SSB SYSTEM</th></tr>
<tr><td>STRENGTHS
• An expandable, transportable and Life Cycle Cost (LCC) reducing processes, methods, and tools
• New supportability options to the PMOs
• Proactive COTS obsolescence risk management process
• Enables Business planning and Management processes for fielded systems</td><td>OPPORTUNITIES
• Life Cycle Cost (LCC) reductions of as much as 50% on all systems depending on program constraints
• Provide the Fleet user with the assurance that their system will be supportable over time and available when needed
• The greater the use of the system the greater the leverage to be gained, thereby expanding its value proposition to the Navy
• Simulation and modeling tools, optimize the business planning and identify future support requirements
• The SYSCOMs require a performance plan, strategy, and management control for CLS/PBL contracting efforts
• DoD has a greater need for risk management methods and practices due to the changes in the DoD 5000 series documents</td></tr>
<tr><td>WEAKNESSES
• New system with a very short track record
• Up-front PMO support and long-term commitment on behalf of the PMO and the support team
• The SSB system is not part of the mainstream contracting process implemented by NAVICP
• Requires a cultural shift from an independent competitive environment to a collaborative interdependency</td><td>THREATS
• Implementation policy regarding Performance Based Contracting (PBC) may curtail or eliminate the possibility of using the SSB system
• Subcontracting government DMSMS support personnel to contractors creates a “conflict of interest” situation for the government employee while yielding sub optimal results for the Navy</td></tr>
</table>

Appendix D Table 2: SWOT Matrix

E. SWOT MATCHING, CONVERTING, MINIMIZING, AND AVOIDING STRATEGIES

How can we match our strengths to our opportunities to create capabilities in serving the needs of our customers?

Strengths:

1) An expandable, transportable, Life Cycle Cost (LCC) reducing processes, methods, and tools
2) New supportability options to the PMOs
3) Proactive COTS obsolescence risk management process
4) Enables Business planning and Management processes for fielded systems

Opportunity 1: Meeting the PMO objectives in providing Life Cycle Cost (LCC) reductions of as much as 50% on all systems depending on program constraints.

The opportunity to reduce the LCC by 50% will be a result of combining three strengths (1, 2, 4) together to maintain an environment where the PMO has cost effective options, which can be planned for and then implemented according the plan. Implementing the processes, methods, and tools of the SSB system as part of the Systems Architecture will leverage other functional areas based on sound Business Planning and Management processes that will provide the PMO with options. The variety of options available to the PMO due to the SSB system's structure allow programmatic decisions to take into account the program's core requirements by elevating many of the once hard and fast constraints inherent in COTS products. Using this flexibility the PMO can choose to focus on reducing the overall program LCC.

Opportunity 2: The SSB system defines pro-active risk management methods for COTS products that provide the Fleet user with the assurance that their system will be supportable over time and available when needed.

The long-term supportability of fielded systems is the primary purpose of the SSB system because it directly impacts the availability and utility of the fielded systems used by the Fleet. The processes, methods, and tools identify the specific obsolescence risks involved with each COTS product, the Business Planning and Management processes are then used to manage these risks through the use of a cross functional team. The emergent property provided by the SSB system associated with this identification and management

practice yields the assurance that the fielded COTS products will have long-term support and predictable performance to meet the Fleet user requirements. The strengths (1,3,4) map directly to the pro-active risk management whereby the Fleet user requirements are met.

Opportunity 3: Growth and maturity of the SSB system provides greater opportunity for other Navy programs to leverage this unique internal resource expanding its value proposition to the Navy.

The expandable and transportable characteristics identified in strength #1, directly influences the leveraging opportunity, which expands the value proposition to the Navy. The SSB system establishes a reusable foundation of relationships with the OEMs and detailed information with respect to specific configurations whereby subsequent program implementations that use the same COTS products will not need to redo this work but instead just reuse the current established information. The logical follow-on to this capability is that as the Navy implementation of the SSB system increases the possibility of reuse also increases and therefore greater leverage can be captured. The attributes of planning and managing identified in strength 4 provide the PMO with the methods and practices to take advantage of the reuse capability and, as a product of the Systems Engineering approach, allow the expansion of the value added proposition to the Navy.

Opportunity 4: The SSB system employs several simulation and modeling tools to optimize the business planning and future support requirements for fielded program systems.

All four strengths in some way support the simulation and modeling tool and the ability to do business planning specifically required for forecasting of funding requirements and future fielded product needs. The predictive attributes of the SSB system are a direct result of the inherent characteristics of the System Architecture and the Systems Engineering approach employed in the SSB system's design.

Opportunity 5: The Naval Audit Service (NAS) has recently released reports indicating that the implementation of the Contractor Logistic Support (CLS) contracting methodologies used by NAVSEA and SPAWAR lacks adequate visibility and metrics that would assure proper oversight

The first and fourth strengths map directly to this opportunity, in that, the SSB system contains processes, methods, and tools, which provide the infrastructure necessary to support the business and management needs that were found to be lacking identified in

the NAS reports. This infrastructure is an inherent part of the SSB system and can be directly transferable to a program to meet the shortcomings they (the programs) currently exhibit.

Opportunity 6: In early September 2002 Secretary of Defense office rescinded the existing DoD 5000 series documents [22) DJSM] with a memo that stated, the identified hard requirements – the "must do" – Systems Engineering methods will be replaced by a guidance document to provide more leeway to the Program Managers.

One of the predominate strengths provided through the SSB system is the ability to manage the obsolescence risk inherent in COTS products. Additional support processes, methods and tool available through the use of the SSB system allows the PM insight into the programmatic activities and associated costs to the program in managing the long-term supportability issues. With the relaxation of the constraints on the Requirements Generation System the key to success for the PM will be in managing the risks involved with this approach, the SSB system has been developed to help with this task.

How can we convert our weaknesses into strengths?

Weaknesses:

1) The SSB system is a new system with a very small track record.
2) The SSB system necessitates the up-front PMO support and a long-term commitment on behalf of the PMO and the support team.
3) The SSB system is not part of the mainstream contracting process implemented by NAVICP.
4) Implementation of the SSB system will require a cultural shift from an independent competitive environment to a collaborative interdependency of diverse functional groups.

Weaknesses 1&4:

The issues identified in weaknesses 1 & 4 can be directly linked and converted into opportunities using the same approach essentially "killing two birds with one stone". The competitive environment illustrated earlier in this plan identifies many of the characteristics shown by existing DMSMS support groups. Characteristics such as "rice bowl" mentality, the "not invented here" attitude, and "functional stove pipes" are typical of existing DMSMS support groups. These attitudes are exacerbated by the newness of the SSB system's approach and can only be converted into strengths by proving out the

system. The proving out process will require objective evidence showing that once the system has been implemented as a collaborative process the resulting impact to the program lowers LCC, reduces COTS obsolescence risk and provides the PMO with additional options not available prior to the SSB system implementation. Therefore the converting mechanism to go from a weakness to a strength will be evident through the data collected quantifying the success or failure of implementing the SSB system. Keeping a well defined set of metrics regarding LCC reductions and impacts to fielded systems supportability and using these values to illustrate the utility of the system will be critical in having the SSB system embraced by existing DMSMS supports groups.

Weakness 2:

Although the set of metrics listed above will be pivotal in proving the viability of the SSB system some additional information may be needed to convince the PMO and support teams to make long-term commitments and provide the upfront resources. Two approaches can be undertaken to address these concerns. Assuming the viability of the SSB system has been demonstrated through the metrics, a case needs to be made that the metrics taken over time is where the big payoff is for the implementation of the SSB system. This case is well illustrated in the Business Case Analysis (BCA), which can be provided as objective evidence. However, just as impressive would be a testimony from a PMO where the impact to the PMO's systems could be relayed to other PMOs considering the SSB system alternative. This testimony could be as simple as a phone call or perhaps a more formal written statement of accomplishments due to SSB system implementation. The testimony coupled with justification data available in the BCA presents a strong case for making the long-term commitment. The second approach to gain the up-front support can be gleaned from the BCA and other data by examining the particular programmatic system in question and developing predictive indicators that show potential impacts to the program. One such indicator would be calculation of the Return On Investment (ROI) using the criteria from the program in question. This value will bring home to the program the viability of the SSB system when used to meet the program objectives.

Weakness 3:

As identified in several sections of this plan, the implementation policies of NAVICP can present limitations to the SSB implementation efforts although some "work around" and direct confrontational alternatives have been discussed. These alternatives necessitate additional work in order to get the SSB system to receive adequate consideration. Notwithstanding the negative impacts this has on the SSB system implementation efforts the situation does have some redeeming qualities. The current contracting situation requires the SSB system implementation efforts to prove out its utility based on its own merits and advertise or broadcast to a wide range of potential candidate PMOs. If the SSB system is accepted based on its proven utility to PMOs in spite of the lack of support from the contracting processes, then like many successful "grass roots" initiatives the success will help change the contracting process. Use of the SSB system alternative may be the key in incorporating the Organic activities involvement on future DMSMS support teams regardless of the contracting methodology. Should this become the case, the SSB system will be a positive and necessary alternative to be encapsulated in the DMSMS support team planning when accomplished by any Organic activity.

How can we convert our threats into opportunities?

How can we minimize or avoid those weaknesses and threats that cannot be successfully converted?

Both identified threats are a result of the NAVICP's implementation policies with regards to Performance Based Contracting (PBC). Three strategies have been identified to deal with these threats: directly confronting NAVICP, request SECNAV intervention, and increase the awareness of the SSB system in the DMSMS support community. By confronting NAVICP directly there is a potential that they could alter their policies to mitigate the issues regarding Organic activities participation, this change could also go even further and allow the SSB system to compete in an environment having a level playing field, a situation that would favor incorporation of the SSB system as the preferred alternative. SECNAV intervention is another method to instigate the same kind of potential changes as identified with direct confrontation with NAVICP. Either of these

methods could result in converting the threats to opportunities. The third strategy of raising the awareness of the SSB system is meant to avoid, as much as possible, the negative impact of the contracting policies if they cannot be converted.

Do we possess any major liabilities (unconverted weaknesses that match unconverted threats)?

Are these liabilities and limitations obvious to our customers? Are there ways that these liabilities and limitations can be minimized or avoided?

There is one area in which we carry a liability and that is in the area of customer (PMO and support teams) perception of the intent of the SSB system. Many potential customers at first glance will look at the SSB system's as having the intentions of sending old, antiquated technology out to the Fleet and forcing this sub-par equipment on them for time indefinite. Although this first perception is not the intention nor does it describe the purpose of the SSB system, it is a liability, which must be overcome. To address this issue we will be developing through this plan, methods and tools to project an "Image" that is more closely aligned with the purpose and objectives intended through the use of the SSB system.

V. MARKETING GOALS AND OBJECTIVES

The marketing objectives involve establishing the SSB system as a unique standard practice while projecting the image as an enabler of currently used support systems, that are employed during the decision-making processes regarding supportability of COTS products. Our current goal of 20% capture of the Navy programs translates to 72 programs or an equivalent 80 man-years per year, and it is estimated that this amount of captured programs will establish the SSB system as one of the standard solution alternatives.

A. MARKETING GOAL A

- Implement the SSB system on 20% of the available Navy programs over the next 3 years.

Objective A1

- Project the amount of Organic activity workload generated by capture of 20% of the available Navy programs.

Specific and Measurable outcome:

The total available estimated market size is the sum of all programs within the Navy and that value is 365 programs. The size of each program is unique -- some are very small (i.e. small unique pieces of equipment) while others are extremely large like AEGIS and the Virginia Class submarines. The SSB system is designed, to be tailored to meet the needs of the programs, this includes the size and other unique factors specific to a program. The larger the program size, the more expansive the SSB effort becomes for that given program. The number of programs directly relates to the number of potential customers and each customer will have a unique SSB effort tailored to its needs. The amount of COTS products on a program will also define the SSB efforts since the SSB system is designed to provide long-term supportability for the COTS products.

In an effort to estimate the amount of COTS on the total distribution of Navy acquisition programs we queried the COTS database at NSWC Crane. This database contains several Navy acquisition programs, of them 13 were evaluated and assigned an

estimate of the percent of COTS per program using engineering judgment, as identified in Table 1 [23) Braun].

Program	Equipment Type	% COTS
AN/SPS-48E	Radar	30%
AN/SPS-73(V)12	Radar	75%
CEC	Cooperative Engagement Capability	67%
SLQ-32	Electronic Countermeasures	15%
LPD-17 SWAN	Shipboard Wide Area Network	95%
AN/SSN-6	Navigation Sensor System Interface	75%
MK162	Ship Gridlock System	90%
MK98 Mod 4	Trident Fire Control	70%
AN/BQQ-10 ARCI	Sonar System	85%
AN/MSQ-124	Air Defense Communications Platform	75%
SSDS MK1	Ships Self Defense System	98%
SSDS MK2	Ships Self Defense System	98%
AN/AQS-20/X	Sonar Mine Detecting Set	20%

Appendix D Table 3: Percentage COTS of some Navy systems

Using the data presented in Table 3 a distribution for the percentage of programs using various levels of COTS within the systems can be calculated. The assumption made when developing this distribution is that the Navy system has undergone COTS insertion somewhere in its life cycle. This distribution is only an estimate to achieve a rough order of magnitude regarding the COTS distribution out in our fielded systems. The percent of programs which will have less than 25% COTS should be about – 15% of the programs. The percent of programs which will have greater than 25% but less than 50% COTS should be about – 7% of the programs. The percent of programs which will have greater than 50% but less than 75% COTS should be about – 39% of the programs. The percent of programs which will have greater than 75% COTS should be about – 39% of the programs. Using this estimated distribution and applying it against all Navy acquisition programs the expected market size and associated distribution is:

% COTS	% Programs	Number of Navy Programs expected to be within distribution defined, Assumes total programs as 365	Assume a 20% Program Capture Rate, yields the following number of programs to service
< 25%	15%	55	11
25% < 50%	7%	26	5
50% < 75%	39%	142	28
> 75%	39%	142	28

Appendix D Table 4: Target Market

Assuming a 20% capture rate of the potential market with the given distribution and assuming the programs are all medium size programs we can apply our implementation experience with the SSB system to estimate the amount of potential man/year funding possible. Based on the stated assumptions our experience shows that if the evaluated system is < 25% COTS then it would translate into approximately ½ man/year of work. If the system is between, 25% - 50% COTS it would translate into approximately ¾ man/year. For any programs having 50-75 % COTS, the work effort translates into about 1 man/year. If the COTS content is greater than 75% the work effort is about 1 ½ man/years. This rough approximation yields the following expected target market size:

```
Target Market Size = (# programs,<25% COTS)(.5) + (# programs,25-50% COTS)(.75) + (# programs, 50-75 % COTS)(1) + (# programs, > 75% COTS)(1.5)

Target Market Size = (11)(.5) + (5)(.75) + (28)(1) + (28)(1.5) = 79.25 man/year per year
```

Time Frame:

Fiscal Years – FY03 through FY06

Responsible unit/person:

The SSB Integrated Product Team (IPT), NSWC Corona

Relationship to SWOT:

- Life Cycle Cost (LCC) reductions of as much as 50% on all systems depending on program constraints.
- Provide the Fleet user with the assurance that their system will be supportable over time and available when needed.
- The greater the use of the system the greater the leverage to be gained, thereby expanding its value proposition to the Navy.
- Simulation and modeling tools, optimize the business planning and identify future support requirements.

B. MARKETING GOAL B

Project an Image showing symbiotic nature of the SSB system with the Tech refresh/insertion efforts.

Objective B1:

Prepare presentation materials and reports to link the captured metrics (LCC reductions, risk management, long-term supportability) regarding the SSB system's implementation with information provided from the affected programs on the SSB system's ability to support tech refresh/insertion.

Specific and Measurable outcome:

For each program that implements the SSB system the following set of data will be captured or recorded:

The total LCC reduction comparing SSB system bottom line versus Life of Type Buy (LTB) bottom line.

The total cost avoidance due to SSB system mitigating the necessity for redesign.

Assessment of the accuracy of the predicted versus actual costs and impacts due to SSB system implementation.

Survey of customer satisfaction with regard to the SSB implementation efforts

Interview with customer then prepare a structured report covering implementation experience and lessons learned.

A summary assessment of the implementation effort prepared by the SSB systems implementer and the supporting SSB IPT.

A summary report will be prepared for each program evaluating and reporting all data gathered. All summary reports will be combined and analyzed for trends, common

threads, exceptional areas (good and bad), and effectiveness of implementation. Both types of reports will be prepared for publication and available upon request.

Time Frame:

Reporting information will be collected and a report prepared within one quarter after the close of FY03 and repeated every year thereafter.

Responsible unit/person:

The SSB IPT leader

Relationship to SWOT:

The greater the use of the system the greater the leverage to be gained, thereby expanding its value proposition to the Navy.

- Requires a cultural shift from an independent competitive environment to a collaborative interdependency.
- New system with a very small track record.
- Up-front PMO support and long-term commitment on behalf of the PMO and the support team.

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VI. MARKETING STRATEGIES

A. SEGMENTATION & DIFFERENTIATION

Segmentation: The first tier of segmentation is at the Market level. For our services and products the appropriate segment at the Market level is the Niche Marketing. The particular niche market is specific to Navy programs with a need to support their systems that contain COTS products. The criteria that can be applied to our niche market, which forms the basis for differentiation, can be described using three independent attributes, which are critically important to the customer. The specific characteristics that define these attributes are: Life Cycle Cost (LCC) impact, obsolescence risk management, and Long-term supportability attributes. Table 5 below identifies the primary methods employed by DoD/Navy DMSMS support teams/groups. The position of the SSB system relative to these established practices and a few other commonly used methods are discussed in subsequent paragraphs to illustrate the differentiation exhibited by the SSB system with respect to the established practices.

Resolution	LOW ($)	AVERAGE ($)	HIGH ($)
Existing Stock	0	0	0
Reclamation	629	1,884	3,249
Alternate	2,750	6,384	16,500
Substitute	5,000	18,111	50,276
Aftermarket	15,390	47,360	114,882
Emulation	17,000	68,012	150,000
Redesign— Minor	22,400	111,034	250,000
Redesign— Major	200,000	410,152	770,000

Appendix D Table 5: Alternatives Cost Matrix [16) DMEA]

In addition to these 8 categories of alternatives listed in Table 5, the Department of Defense DMSMS Working Group [24) DoD] defines three other commonly used methods:

- Redefine Requirement to Accept Commercial Item
- Life of Type Buy (LTB) – also known as Life Time Buy or Bridge Buy
- Reverse Engineering (RE)

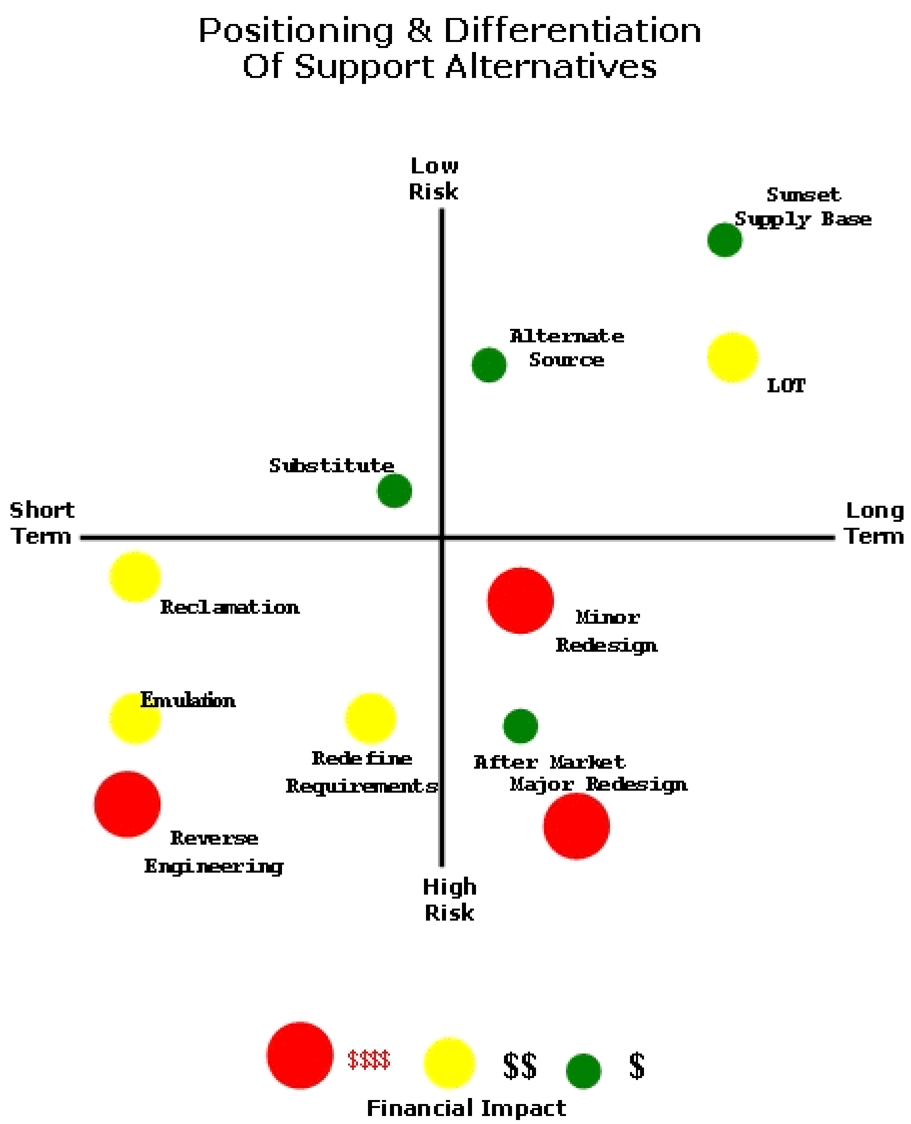
Combining all these alternatives (including the SSB system) and applying experience and engineering judgment we will assign values/labels for the measurable criteria using the following parameters:

- Risk – High, Medium, Low – to identify that once this resolution method is used it carries with it an amount of risk of being problematic or unsuccessful
- Cost – $$$$ (most expensive), $$ (mid range cost), $ (low LCC) - Unlike the point solution cost shown in Table 5, the cost identified here is impact to Life Cycle Cost (LCC) which may or may not be the least expensive initial cost, for example and alternative part may be found but that resolution may be short lived whereby within a few years another alternative part needs to be identified, paid for and implemented.
- LTS – Long-term supportability, LT (long term > 10 years), MT (Mid Term 5-7 years), ST (Short Term <5 years), these values are based on engineering judgment and experience.

The alternative of "Existing Stock" is not considered as an alternative because if stock currently exists and there is a shortage, other alternatives will be used to mitigate the issue (i.e. LTB). The remaining alternatives are assigned the following attributes:

Alternative Type	Risk	Cost (LCC)	Supportability (LTS)
SSB system	L	$	LT
Life-of-Type (LOT) Buy	L-M	$$	LT
Reclamation	M	$$	ST
Alternate Source	L-M	$	MT
Substitute	M	$	MT
Aftermarket	M-H	$	MT
Redefine Requirements	H	$$	MT
Emulation	H	$$	ST
Redesign - Minor	M-H	$$$$	MT
Reverse Engineering	H	$$$$	ST
Redesign - Major	M	$$$$	LT

Appendix D Table 6: Positioning and Differentiation Table



Appendix D Figure 5: Positioning & Differentiation of Support Alternatives

B. TARGETING & POSITIONING

1. Resolution Type & Positioning Justification SSB System

A method to extend the life cycle of an assembly using a Systems Engineering approach to manage the obsolescence risk inherent in COTS products and provide long-term support of fielded systems.

- Risk – Establishes risk management methods, processes, and tools to provide Low Risk to the program's systems. Low Risk - L
- Cost – Uses business and management processes and practices to partner with the OEM and supplier community to constrain the LCC. Low Cost - $

- Supportability – Provides an overarching Systems Architecture, which enables long-term support. Long Term - LT

Life-of-Type (LTB) Buy (also referred to as LOT)

The OEM, its distributors, or aftermarket suppliers may have enough inventory to meet the projected demands of the supported equipment for the rest of its operational lifetime or may continue to produce the component for a specified amount of time. [16) DMEA]

- Risk – The LTB Buy requires a good deal of upfront investment which if not used will be wasted, this is especially risky if and when the program requirements are altered and equipment configurations changed. Risk to the financial health of the program and potential lack of flexibility in meeting future program requirements. Risk – L-M
- Cost – Large initial investment at the very beginning of the program system life cycle and potential large impact to LCC if program requirements are altered. Mid Range Cost - $$
- Supportability – Even though the LTB Buy alternative requires large upfront costs the long-term supportability is very good provided that no changes in requirements are experienced. Long Term - LT

Reclamation

The component may be available from surplus inventory; from equipment that is beyond economical repair, is in deactivated or decommissioned units, or was removed as part of a modernization program; or from the Defense Reutilization and Marketing Service (DEMS). Some refurbishment or testing may be required.[16) DMEA]

- Risk – This point solution usually entails incorporating a part of unknown origin and using it in a functioning system, such things as MTBF, previous stressful environments, and current component condition present the new system with undefined risks. The process of reclaiming the part may further deteriorate the component adding other undisclosed risks. Medium Risk - M
- Cost – The cost of reclaiming parts/assemblies is expensive not only because of the process but also because of the detailed documentation and testing necessary. Mid Range Cost - $$
- Supportability – Reclamation is a point solution usually used a last result in making up some short-gaps in the supportability of the fielded system. Long Term - LT

Alternate Source

If part specifications and test, acceptance, and related technical data are complete and available, an evaluation of the manufacturer production capabilities, tooling, test programs, etc., must be accomplished to ensure the ability to meet the original item specification requirements. [24) DoD]

- Risk – The risk involved with establishing an Alternate Source is primarily the technical risk accompanying technology transfer. Potential performance risk to fielded system. Risk Low - Medium – L-M
- Cost – Technology transfer if done well can be accomplished at low cost although set-up, testing, and qualification may vary in their impact to the overall cost. Low Cost - $
- Supportability – Depending on the purpose for the technology transfer and the associated supplier relationship the support requirements for the Alternate Source are typically used for mid term needs but could be extended to meet long-term requirements. Mid Term - MT

Substitute

It may be possible to use a similar component with an acceptable number of design differences that will not degrade the performance of the equipment. [16) DMEA]

- Risk – The risk involved in using a substitute part is mostly technical, essentially the way the new part responds to the fielded system and visa-a-versa, many times it's response is an unknown until fully exercised and tested in the system. This mid range risk is considered slightly less than the Alternate Source because the OEM for the substitute part has a history with manufacturing and testing the part so they understand the parts capabilities. Medium Risk - M
- Cost – With regard to LCC the resolution is usually as simple as picking a part already in production then paying to have it tested and qualified for the application. Low Cost - $
- Supportability – The substitute part has it's own life cycle and the expectation that this part also may go obsolete and therefore categorizes a substitute part a point solution that may or may not last the life cycle of the fielded system. Mid term - MT

Aftermarket

Manufacturers sometimes buy discontinued production lines to maintain component production, or suppliers buy quantities of components that are obsolete and store them for future sale. [16) DMEA]

- Risk – The issues which arise from implementing an Aftermarket Manufacturer are problems and risks that become evident due to a lack of adequate processes, specifically: Technology Transfer processes not addressing technical issue, business processes not addressing the OEM or Aftermarket Manufacturer needs (i.e. contractual issues), and Program Management processes not providing adequate up-front planning. Unless a Systems Engineering approach is taken to address these risks, the successful transfer of the technology is at best at high risk. Medium – High Risk – M-H
- Cost – The impact to the LCC using this alternative, if accomplished correctly, is low and even if the technology transfer has problems the Aftermarket Manufacturer usually is stuck with most of the costs. Low Cost - L
- Supportability – The part once transferred is not necessarily protected against the obsolescence risk issues prevalent in COTS products. This exposure will eventually lead to a short-fall in providing adequate supportability over the life cycle of the fielded system. Mid Term - MT

Redefine Requirements

The process is similar to the substitution alternative, except you are redefining the item to accept a commercial item already available, instead of finding an item which is similar to the DMSMS item. [24) DoD]

- Risk – Although the technical process of evaluation may be the same the impact to risk is completely different. Changing the systems requirements has a large risk associated with it because of the unknown perturbations and unintentional consequences that may result. Additionally the changing of the system specification is another process that injects added business and programmatic risks into the scenario. This alternative represents a high risk to the program and fielded system. High Risk - H
- Cost – The impact to the LCC will be due in part to the defining, implementing, qualification and testing of the new part and in part because the business and programmatic processes will need to be altered or used and therefore must be funded. Mid Range Cost - $$
- Supportability – Like the substitute part, this new part with redefined requirements, has it’s own life cycle and the expectation that this part also may go obsolete and therefore categorizes a the part as a point solution that may or may not last the life cycle of the fielded system. Mid Term - MT

Emulation

A government or industry laboratory may have developed or have the capability to develop an F3I (Form, Fit, Functional) – compatible replacement that matches the obsolete component. [16) DMEA]

- Risk – The technical and applications risks are mid to high when employing emulation. Not all the technical risks are evident when first designing, fabricating, and testing the emulated part and therefore a medium risk. The application the part will be put into will not have all potential parameters defined and many times critical parameters cause failures in the application and are totally unexpected resulting in a high risk in integrating into the application. High Risk - H
- Cost – Emulation carries with it a fairly substantial price because it is an engineering design function just at a lower functional level, it therefore must be funded appropriately. The impact to the LCC may be significant over time since the emulation is a point solution that may need to be repeated over the system life cycle. Mid Range Cost - $$
- Supportability – Like the substitute part, this new part is specific to this unique application and has it's own life cycle and the expectation that this part also may go obsolete and therefore categorizes a the part as a point solution that may or may not last the life cycle of the fielded system. Emulation exacerbates the life cycle issue in that it is specifically made for the application and therefore cannot leverage off of other applications to keep the obsolete parts supported. Short Term - ST

Redesign – Minor

The equipment may need to be redesigned to accept alternative components (e.g., a new layout of the circuit board). If no other resolution is cost-effective, a new design may be necessary to completely replace the obsolete component. [16) DMEA] Although both minor and major redesign efforts are given the same definition by DMEA the two are differentiated by the level of indenture. The minor redesign typically deals with either a component on a lower level of assembly or the lower level assembly itself. The major redesign efforts encompass such areas as significant impacts to software, interoperability, or some dependent interaction with the system as whole.

- Risk – The technical and applications risks must be combined with business (e.g., contracts, funding profiles, PPBS, etc.) and Program Management (i.e. Configuration Management (CM), ILS, scheduling, funding allocation, etc.) processes as part of the risk scenario. Although it must be pointed out that a minor redesign will carry with it a smaller impact and therefore lower risk than a major redesign. Medium – High Risk – M-H

- Cost – On our crude scale of impact to LCC both minor and major redesigns carry the same identifier even though the costs between the two types are vastly different. Most Expensive - $$$$
- Supportability – Important to note is that the major redesign should result in a fairly robust long-term supportability of the fielded system. The expectation is that the designers are required to take into account the system supportability issues when redesigning the system. However, through our implementation experience with the SSB on COTS products, we found that most every major and minor redesign had obsolescence issues even before being incorporated into the system. Therefore major redesign reflects the same mid term supportability as is the case with minor redesign. On the other hand, a minor redesign by definition is constrained to a lower level of indenture and will not look at overall system supportability since it is out of scope for the effort. The minor redesign therefore has the potential of being affected by system impacts decreasing it's long-term supportability to somewhere just above the mid range. Mid Term - MT

Reverse Engineering

An exact replica of the component may sometimes be developed by disassembling and analyzing the component; developing design data through measurement, testing, and destructive evaluation; producing coordinate measurement machine (CMM) documentation of the component; conducting technology insertion reviews; developing and verifying technical data packages; and performing first article inspection and testing. [16) DMEA]

- Risk – The technical and applications risks must be combined with business (e.g., contracts, funding profiles, PPBS, etc.) and Program Management (i.e. CM, ILS, scheduling, funding allocation, etc.) processes as part of the risk scenario. Reverse Engineering is an alternative of last resort because it many times fails completely. High Risk - H
- Cost – The LCC drivers are obvious as is the impact to the program but if successful the program will have in its position the ability to make the part for as long as needed. Most Expensive - $$$$
- Supportability – The Reverse Engineering alternative is not only costly with high risks but is a point solution for a very specific application. This application may be affected by other parts of the system and the result may render the effort meaningless. Only if the remainder of the system is constrained by an "Iron Fisted" CM requirement should one consider this option. Therefore this alternative is labeled as a short-term supportability alternative.

Redesign – Major – (see Redesign – Minor)

C. TARGET MARKETS

The target markets which are of interest to us are those PMOs (customers) that will receive the most benefit by implementing the SSB system thereby building on our satisfied customer base. Our customer base will be a subset of the identified 365 established Navy programs, with the goal of capturing 20% of the total. Certain characteristics of a program will enhance the potential benefits received through implementation of the SSB system. A few of the characteristics we will focus on are: required supportability time, fielded system life cycle phase, criticality of fielded system baseline, total number of COTS units fielded systems. The required supportability time identifies the number of years the COTS products must be obtainable to install new applications, repair/replace Fleet returns, and maintain fielded systems. The preferred supportability time should be greater than 5 years as measured from the date of inclusion into the fielded system design. The reason that this 5 year period is significant is because of the 1.5-2 year life cycle of the COTS products along with the typical support period of 2-4 years combined together will support the fielded systems without the need for extended support. The fielded system life cycle phase is important since it describes the maturity of the system, which in turn provides an indicator of the current supportability of the system. The sooner in the life cycle the better with regards to implementing the SSB system and if given a choice the preferred time interval would be within 10-15 years of design. After this 10-15 year period more and more of the supportability solutions result in redesign and fewer can be remedied using the SSB system. Depending on the fielded system the Configuration Management of the system baseline may be critically important to the customer, this is especially true when dealing with certified systems (i.e. combat weapon system, safety system, etc.) Our target market will usually have some kind of constraint regarding the system baseline. The last characteristic to look for with our target market is simply common sense and following the business math, in essence the more volume the greater potential to save cost. In summary our "Target Market" can be describe by the following attributes:

- Supportability time requirements > 5 years from design/refresh date
- Fielded Systems age < 10-15 years from design/refresh date

- Customer has CM constraints for fielded system baseline
- Look for programs with high percentage of COTS products.

It is important to remember that the above listed fielded systems characteristics are not constraints, in other words the candidate system under consideration need not have any of these characteristics for the SSB system to be implemented. However, if it were Christmas and we could pick and choose which programs to go after, this list is a good starting point because on these types of systems the SSB system returns maximum results.

D. KEY CUSTOMER AND COMPETITOR REACTIONS

What are the likely customer and competitor reactions to marketing mix? How does the marketing mix give us a competitive advantage in serving the needs of the target market? Is this competitive advantage sustainable?

The SSB system has been designed using a Systems Engineering approach whereby the sustainable attributes and long-term viability were taken into account as part of the system requirements. The marketing mix reflects this long-term viability and addresses each of the 4 P's (Product, Pricing, Distribution, Promotion) through various actions aimed at enhancing the marketability of these designed in attributes. The SSB system is, to the authors knowledge, the only COTS supportability system built from the ground up to take a system wide life cycle view using a Systems Engineering approach. In essence the competitive advantage achieved through the SSB system is permanently embedded into the methods, processes, and tools incorporated into the System Architecture.

VII. MARKETING IMPLEMENTATION

A. STRUCTURAL ISSUES

The Marketing Plan is neither an independent or stand alone process/method, instead it is embedded as an integral part of the SSB system itself such that a marketing customer focus is maintained throughout all aspects of the approach. Especially true in the product development phase. Therefore in order to understand the marketing implementation efforts knowledge of the SSB systems implementation or SEDI is necessary. The Systems Engineering Development and Implementation (SEDI) plan is one of four foundational documents prepared in support of the Sunset Supply Base (SSB) system. Although the SEDI is extensive and should be reviewed for a complete understanding the following description illustrate some of the major areas in which the Marketing Plan must interface. The purpose of the SEDI plan is to put into perspective the processes, methods and tools needed to implement the Sunset Supply Base (SSB) system. The SEDI plan document is presented as a "stand-alone" prescriptive set of actions, which can be taken in the establishment of an SSB system. However, the SEDI plan document does not portend that it is the only process or method to establish such a system but instead is the method the authors have chosen to implement the SSB system. The document is constructed in three major sections, which follow a brief introduction to the SSB system concept. The primary issues grappled with in the SEDI plan are those faced during implementation and encountered primarily when bringing the idea into reality. The first section of the SEDI plan addresses introduction to the program and the infrastructure needed to support the effort, such areas as: teaming structure, computer resources, communication methods, interface with the programs, data structure requirements, management participation, etc. The second section of the plan covers the implementation of the SSB system and, in turn, presents many challenges to overcome in realizing the SSB system. The final section of the plan identifies methods and metrics to measure the impact of implementing a SSB system, thereby providing adequate indicators for the programs to assess the effectiveness and value proposition in using the system.

B. MARKETING MIX

Product

The SSB system provides a structured set of processes, methods, and tools embedded in a System Architecture based on a collaborative framework. Although the SSB system yields many sub-products, discussed below, this Marketing Plan is focused on the SSB system as the product provided to the customer and not just the sub-products identified herein. The SSB system employs information and risk sharing, relationship building, and long-term planning to yield definable, measurable, and reportable impacts to fielded systems. The customers (PMO and support teams) consider both the implementing of the SSB system and the report outputs of the SSB system as products. As such, the implementing processes such as information and risk sharing directly impact the qualitative output assessments like the obsolescence risk of COTS products in fielded systems. The customers expectations include visibility into the processes and qualitative/quantitative assessments that accurately define the subsequent output of the process. To meet these expectations we have developed the following implementation and output products:

Implementation Products –

- Documented 17 Step Process
- Prioritized COTS List & Vendor Information
- Vendor Status Report

Output Products –

- Obsolescence Health Report
- High Risk (RED) Component List
- Obsolescence Impact & Purchase Request Report
- Assembly Master & Cost Matrices, with Definition Worksheet

The implementation products provide the insight to the customer regarding the qualitative assessment of programmatic risk with respect to the relationship building, information sharing, and risk management practices employed. The output products

organize the data and information gathered then assesses the potential impacts and recommends proactive actions to mitigate programmatic risks. These processes, methods and tools are quantitative in nature and are presented in a format to provide input directly into the business and program management processes. Collectively these products represent new knowledge and options for the PMO and support team. Furthermore the modeling and simulation tools give the decision makers the opportunity to make side-by-side comparisons of different potential candidate recommendations prior to making the final decision. As identified in Figure 5 “Targeting and Positioning”, the SSB system provides exceptional and unmatched customer service in three important areas: obsolescence risk management, Long-Term Supportability, and Life Cycle Cost Reduction.

The products themselves are designed to provide unambiguous bottom line LCC and risk assessments and present the results in easily communicated format. The reports from one program application can be aggregated with others to provide a composite picture of the SSB system’s success story. The reports required per goal and objective “B” were defined to meet this aggregate/composite success story in order to help define the SSB system’s “Image” as – Alternative of Choice – as perceived by the PMO and the support teams. This reporting mechanism can be used as an “Evergreen” product (i.e. constantly be updated with the newest information) to promote the use of the SSB system and placed on a web site readily available to the DMSMS community. User observations and information have and will be used to develop the product. Business case study results will be used to further perfect and build the product. The product will continue to be built as more and more users use the product and the database grows.

Pricing

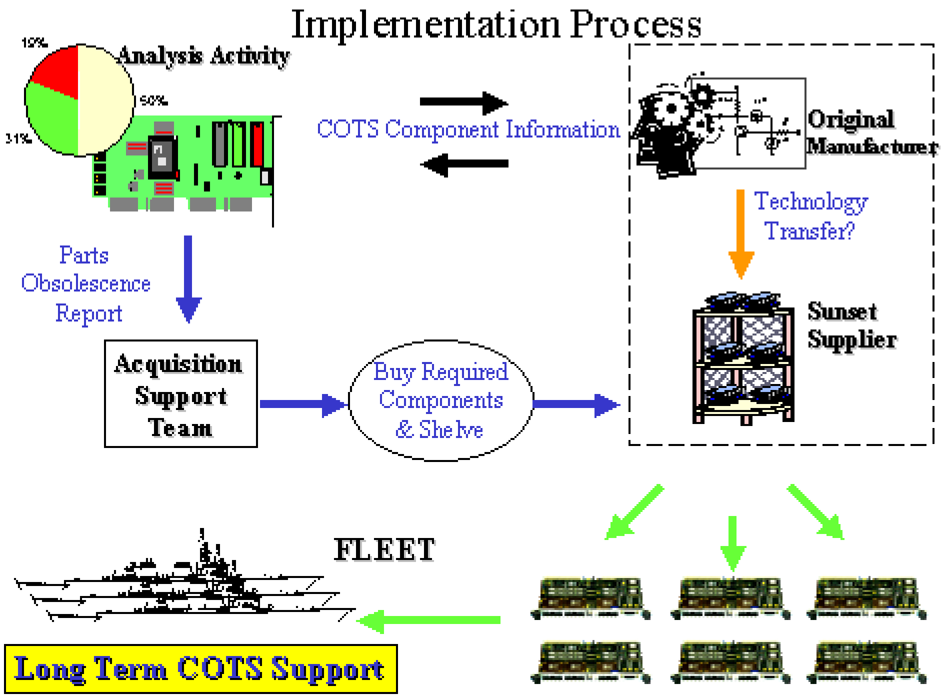
The pricing of our services and products will need to be estimated and identified in a proposal to the PMO specifically tailored to the application. Rough Order of Magnitude (ROM) estimate methods were suggested early on in this plan to estimate market size and to set marketing goals. These ROM estimates assumed that the identified programs (see Table 3) were approximately the same size as the SSDS program which has about 115 different unique COTS products and is considered a medium size program. To these estimated values are reiterated here so if no other method is available at lease a

ROM could be generated to get the process going. Based on the stated assumptions our experience shows that if the evaluated system is < 25% COTS then it would translate into approximately ½ man/year of work. If the system is between, 25% - 50% COTS it would translate into approximately ¾ man/year. For any programs having 50-75 % COTS, the work effort translates into about 1 man/year. If the COTS content is greater than 75% the work effort is about 1 ½ man/years.

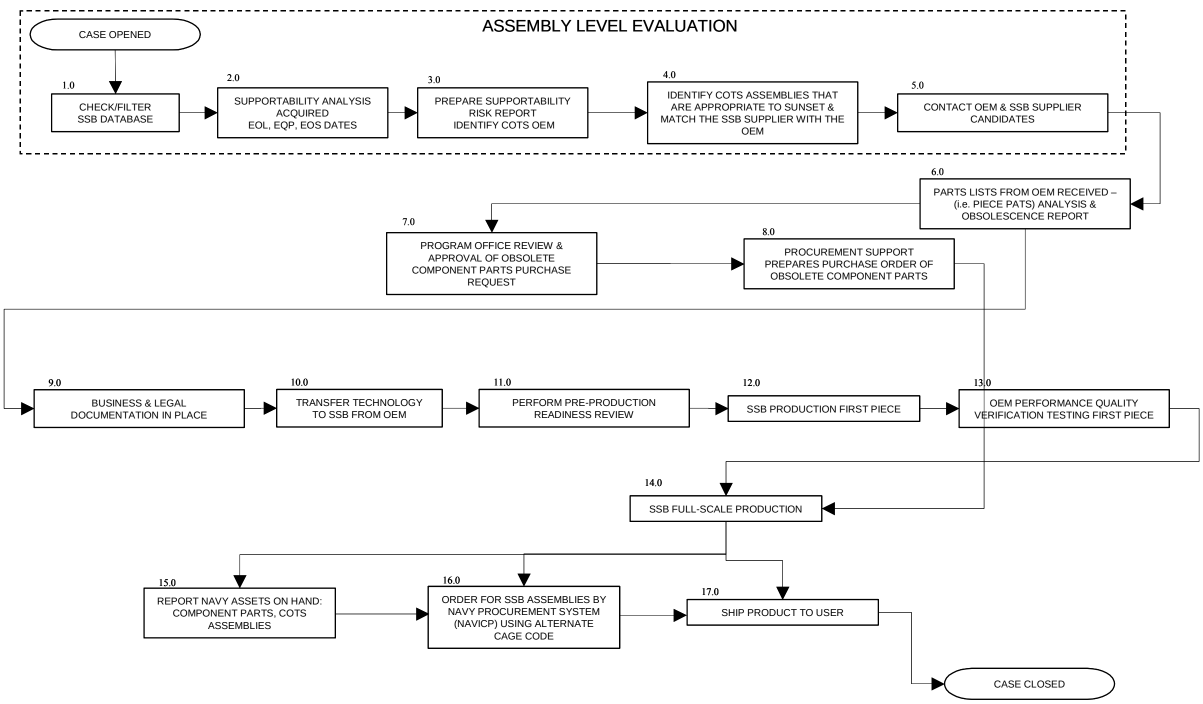
Another way to look at the pricing issue would be to use the SSDS MK 1 data set and estimates of support resources to drive an average cost per part per year. Estimates for the MK 1 system resource support covering the setup and long-term support for 89 unique items over a ten year period resulted in a cost of $1,836.00 per item per year. Since this value is derived from other estimates there is a large amount of uncertainty associated with the accuracy and utility of the number, however it is another approach that could be use to perform estimating efforts.

Distribution

The SSB system comprises several processes during the implementation of the concept. As identified in Figure 6 “Implementation Process”, a relationship building process is established to obtain the COTS Component Information from the Original Equipment Manufacturer (OEM) for analysis. Arrangements are made at this time to involve a third party to continue manufacturing the products if the OEM chooses not to continue making the products. However if the OEM wishes to participate by continuation of production of the COTS products and share the risk of stockpiling obsolete parts, then the dashed box in Figure 6 identifies the scope of their participation. The component information is then analyzed for obsolescence risk and an assessment is provided to the DMSMS support team to determine the appropriate action plan. Typically the number of high risk parts are defined along with an estimated quantity of each part needed to support the program fielded equipment for a prescribed period of time, usually until the next tech refresh/insertion. These parts are then stocked on the OEM or third parties shelves until they are consumed to make the COTS assemblies needed in the Fleet. Dependent on the programs needs this process provides long-term support for the end user, the Fleet.



Appendix D Figure 6: Implementation Process



Appendix D Figure 7: 17 Step Implementation Process

The 17 Step Process describes the detailed sub-processes needed to implement the SSB system and identifies many of the intermediary products used by the PM to provide visibility into the process are identified here. This process flow illustrates how information and data are collected and disseminated; where in the process these actions take place; what are the expected outcomes of the

process; and who is expected to accomplish which tasks. Below is a definition of each step in the process:

Case Opened: Requires initial information (BOM, COTS list, etc).

Step 1.0

The Program Office provides the indentured Bill Of Materials (BOM) complete with suppliers' CAGE codes and part numbers, to NSWC Corona for analysis. The Commercial Off The Shelf (COTS) products, usually at the assembly level, are identified and compared against the current SSB database to identify if any of the items have already been placed in the Sunset Supply Base (SSB). The products will fall in one of three groups: 1) Part Number at the assembly level is already placed with the SSB, 2) An SSB relationship is set up but not for assembly in question, and 3) No SSB relationship exists. For any products not already in the database (groups 2&3), the Original Equipment Manufacturer (OEM) – COTS Vendor – will be contacted to identify supportability time line for each assembly, additionally parts lists along with an outline drawing at the assembly level will be requested for use later. Some suppliers prefer to wait until assurances are provided (such as a Non-disclosure agreement) before releasing this information.

Step 2.0 & 3.0

A health analysis (Red, Yellow, Green) of any microcircuits and COTS assemblies is obtained or generated to identify risk and set priorities. An obsolescence report is developed to inform the PMO of known obsolescence issues and the plan of action regarding the un-identified risk issues with regard to COTS assemblies. If a COTS assembly exists in the SSB database and has obsolete parts, a coordinated recommendation between NSWC Corona and the PMO or support agent, will be made to purchase the amount of obsolete component parts necessary to support the expected future orders to meet the programs requirements. These piece parts will be bought through the SSB supplier who will then store them on his shelf until consumed through future assembly orders from the program.

Step 6.0

After signing Non-Disclosure Agreement between NSWC Corona and OEM, the list of components on the COTS assembly of interest is received by NSWC Corona, a

health assessment of each component on the assembly is conducted to determine status (red, yellow, green), and finally an assembly level health assessment report is issued.

Step 7.0 & 8.0

Program Management Office or support agent to review the plan of action and recommendations, iterate if necessary, task NSWC Corona to implement the plan and provide the purchase order(s) to the appropriate SSB suppliers to mitigate risk to specific COTS assemblies.

Step 4.0, 5.0, and 9.0

Based on experience and knowledge of the SSB supplier and the OEM, NSWC Corona will use a Systems Engineering approach and senior Quality Engineers to match the two companies in three primary areas: performance, technical capabilities, and Business Practices. Periodic, in-plant, formal reviews at the SSB suppliers facilities will be used to keep a current assessment of these three areas. Assessments will be based on the IEEE assessment templates and other industry best practices. The two companies will be matched but since this is a collaborative system and necessitates voluntary involvement, the final choice of teaming partners is with the two companies. NSWC Corona's role is one of technical assistance and facilitation. A contractual agreement is defined by and implemented through the two companies, a Memorandum of Understanding (MOU) may be used encompassing all three entities to facilitate communication.

Step 10.0, 11.0, 12.0, and 13.0

These steps identify major milestone activities, which must be accomplished successfully to establish the SSB supplier as a second source for the COTS assembly. Transfer of the technology from the OEM to the SSB supplier is assisted through the technical assistance of NSWC Corona Quality Engineering staff. Facilitation and coordination with the Program Office and other involved parties (i.e. In-Service Engineering Agent (ISEA), field activities, procurement agent, etc.) is one of the key functional responsibilities of NSWC Corona and during this transfer process NSWC Corona will perform an operational and capabilities review thereby establishing the original baseline assessment of the SSB supplier. The OEM is the responsible party in all

these steps, as the design and manufacturing expert and owner of the intellectual property, they (the OEM) have a vested interest in assuring the successful transfer to substantiate the business case.

Step 14.0, 15.0, 16.0, and 17.0

The full-scale production of the transferred COTS assembly will be dependant upon the Navy's requirements for the product. Procurement of the assemblies will take place using existing methods and processes but be directed to the SSB supplier by adding the SSB supplier CAGE code as an alternate manufacturer in the procurement system controls. On a periodic basis an obsolescence report will be generated to assess the on-going risk to the program and assess if component parts need to be purchased and placed in the SSB suppliers inventory to support future build requirements. The SSB supplier will provide visibility and control over the Navy assets in their inventory. Periodic reviews of the SSB suppliers' facilities, operations, business practices, manufacturing methods and quality, will be accomplished to assure the long-term viability of the SSB suppliers, providing a pro-active risk management approach.

When evaluating the distribution process it is important to include the network and partnerships we have cultivated through implementing the SSB system. The collaborative approach we have taken with other groups, activities, and other members of the community has yielded several partnerships where our partners have identified SSB system opportunities and brought us the work. Conversely we have been tasked by PMOs to accomplish some work which a portion of the work another activity is better suited to do, so in this case we bring in their expertise and provide the funding. Working in this manner – "I'll scratch your back if you scratch mine" – we have several Navy activities, OEMs, and contractors suggesting to their PMO that our services be brought in to help solve the issues with COTS products. Essentially our partners are working as our marketing and sales force and they do it because it makes good business sense; by incorporating the SSB system it brings greater value to their services and products as perceived by their customer.

Promotion

Who is our audience that will use or influence the use of the SSB system?

1) Decision Makers – Contractor & Government - [Early Adopters]
   a. Program Manager
   b. Design/Developers
   c. Technology Insertion Managers
   d. DMSMS Support, Policy making Community
   e. Recourse Sponsor
2) GateKeepers / middlemen / intermediaries - [Early Majority - Late Majority]
   a. ILS Manager
   b. Procurement Managers
   c. DMSMS Team Lead/Managers
   d. SYSCOM Policy Managers
   e. Fleet Support Managers/ISEAs
3) Using Community – [Innovators – Early Adopters - Early Majority]
   a. Designer/Developer – Government & Industry
   b. Software/Hardware Integration sites
   c. End Users – Fleet & Shore
   d. DMSMS Professionals, Gov. & Industry

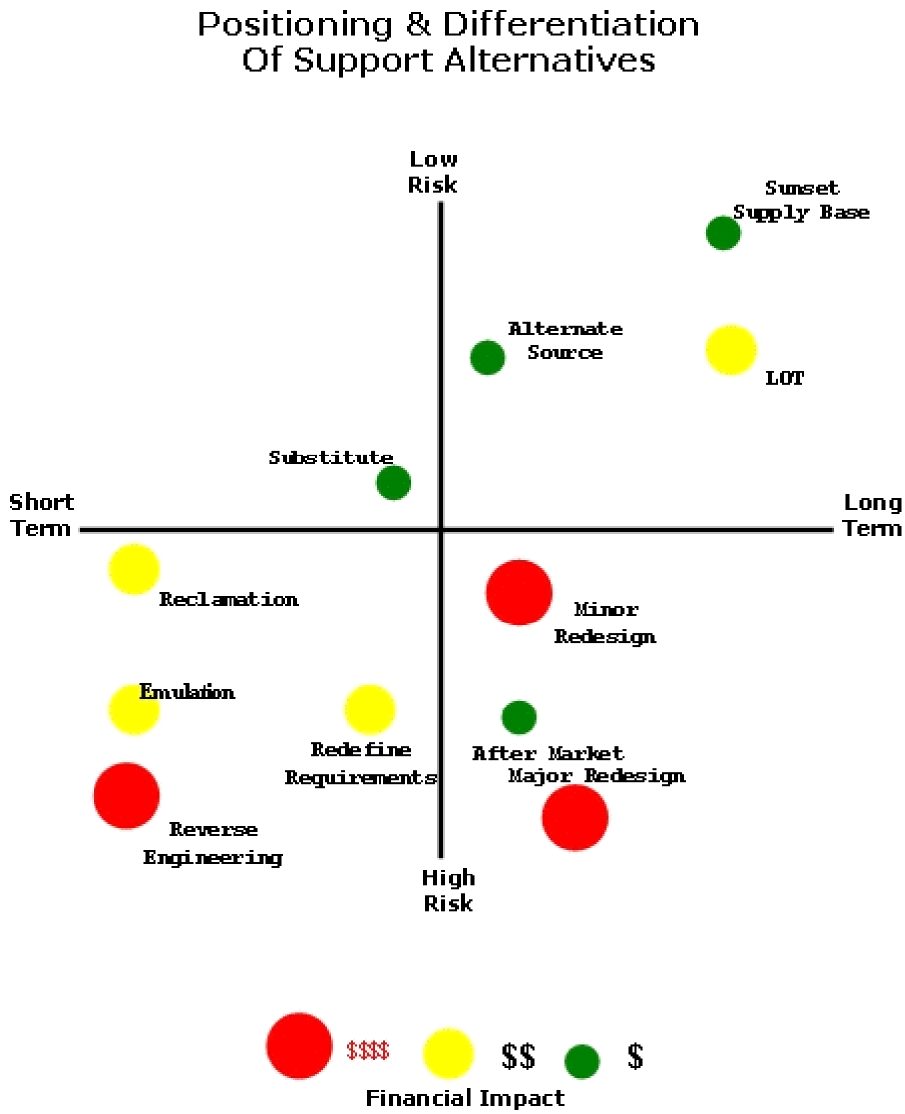
Summary of overall promotion strategy:

Each of the segmented consumers/influences provided above will have a tailored plan crafted to meet their obsolescence risk needs or create desire for the SSB system products. Given that our product is in the "Market Introduction" part of the product life cycle and quickly headed toward a "Market Growth" as a result of successful initial implementation efforts on three Navy programs, provides some special attributes, a fact that will and should be evident in our promotions. Another re-occurring theme throughout our promotion will be stressing our "Product Leadership" as our marketing strategic direction. This direction will be evident through the emphasis on the new and unique SSB attributes regarding, Life Cycle Cost reductions, establishment of risk management methods and business/PMO flexibility and the resulting benefits to the adopters. As a means to shift our target segmented consumer base, an assessment will be made to their current position with respect to the adoption process (i.e. Awareness, interest, evaluation, trial, decision, or confirmation), then identify the most appropriate promotion objective(s) (Informing, Persuading, or Reminding) to produce the desired

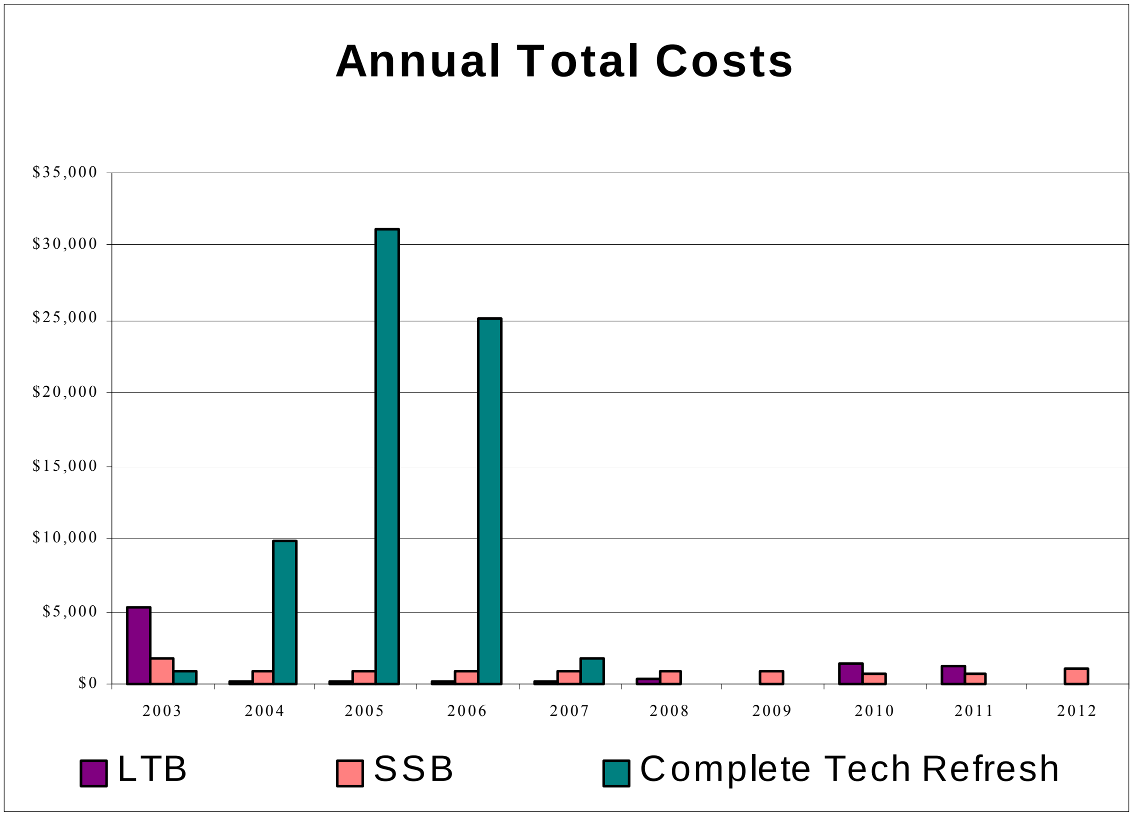
change, by eliciting the responses evident in the action-orientated model AIDA (Attention, Interest, Desire, Action). Finally the type or types of promotion(s) (Personal Selling, Mass Selling, Sales Promotion, Advertising, Publicity) will be utilized to elicit the most favorable response.

1. Promotion Plan for Group 1, Decision Makers

The evaluative criteria (i.e. what criteria the group will use in evaluating the utility of the SSB system) for the decision makers, Group 1 will be risk management capability, Life Cycle Cost reduction characteristics, and Long-term supportability attributes. Additionally this group will look at the SSB system from a business perspective by evaluating the funding profile generated through the use of the system. These criteria are graphically displayed in Figure 8 showing the first three criteria described and Figure 9 illustrating the funding profile of the SSB system versus the Life of Type Buy (LTB) and Refresh alternatives.



Appendix D Figure 8: Positioning & Differentiation of Support Alternatives



Appendix D Figure 9: Comparison of Funding Profiles

The "Decision Makers" are an extremely important part of our consumer base. The promotion approach, to be most effective, must take into account that this group, as identified by market research, is in the "Early Adopters" and are open to evaluating new options when provided the choice. Availability of potential choices must be made base on the awareness of other choices, capturing the groups interest through cost benefit analysis and by showing that evaluation of alternatives will yield outstanding benefits. Therefore the primary promotion objective for our Decision Maker group must be informing to get their attention and spark their interest, the characteristic of being in the Early Adopters category should be self-perpetuating after that. The following marketing activities will initiate our offensive to capture this consumer segment:

Activity 1 - Education & Enlightenment

Conferences

The SSB IPT Team, NSWC Corona (here after referred to as the SSB Team) will take a leadership role and present the SSB system at the leading conferences, which focus

on the Program Manager, Design/Developer and Technology Insertion communities. A vendor booth in the Exhibit Hall where our advertising pamphlets, nic-nac giveaways, and free software on CD ROMs can be combined with our personnel's face-to-face time with the consumer should augment this type of publicity. Although the approach would be identical for all three of these major elements of the group, more than likely, one or two separate conferences for each element may be required. [cost - $1000/day for 3 days times 6 conferences + 6 trips @ $1500 per trip = $27,000]

Publications

The SSB Team will author and sponsor authorship of authoritative articles to be strategically placed in the trade publications targeting this Decision Makers group. These articles will be provided to the internal Navy publication groups: Defense Acquisition University (DAU), Program Manager – PM Magazine, DAU - Acquisition Review Quarterly, etc., at the same time and identified as a leading edge COTS support system. [Team authored - cost $4000 per publication external, times 6 publishers, times 4 separate articles (provided every 3 months) = $96,000 : Sponsored Authorship - cost $5000 to author times 4 separate articles, $4000 per publication external, times 6 publishers, times 4 separate articles = $116,000 : Internal publication considered free of charge]

Collaborative Advertising

In concert with the running of the publications identified above a collaborative and symbiotic relationship should be crafted with the SSB system participants encompassing the entire range of our OEM relationships including industry leaders like Motorola and DY4, to medium and small size companies. The collaborative effort would work this way - the SSB Team would underwrite the feature article and surrounding that article the industry leaders/participants will buy all available (within reason) advertising space displaying their newest, state-of-the-art, COTS supportable products. The Navy will be perceived as part of the industrial supportability solution space pushing state-of-the-art and the industry leaders will be marketing to the Decision Maker group in the Navy. The Navy will need to be directly identified in the article, so as to make this connection and perhaps the industry leaders may wish to also identify the Navy

specifically in their advertising. [cost - Since this is perceived as a collaborative effort minimal cost is associated with this approach]

Activity 2 - Influencing Policy

Point-Counter-Point

The SSB Team will prepare various written artifacts such as “White Papers”, articles, letters to the editor and reports directed at current policy, illustrating the utility of a policy endorsing the use of the SSB system products. These written artifacts are meant to be used primarily inside the Navy in internal publications pointed specifically at the closed community of policy makers. [cost - expected to be minimal]

Face-To-Face

Since the group of policy makers is relatively small although somewhat spread out, regular face time with this group is planned. To augment these visits, high profile individuals of the SSB system community (i.e. industry leader VPs, academia, Presidents of OEM COTS companies, etc.) will be requested to accompany our Teams personnel to meet and possibly present to this policy making group.[cost - $1500 per trip for 6 requested visitors (travel costs) = $9,000]

On-going Policy

Policy is in a continuous state of flux with changes, re-writes and reviews taking place daily. The SSB Team will become part of the technical review community to champion the SSB systems approach and eventually influence downstream policy. [cost - approximately one fourth a man year, $200,000/4 = $50,000]

Activity 3 - Inform Resource Sponsors

Money Talks

Since the Resource Sponsors provide all funding spent in the Navy it is imperative that the benefits of SSB system products, especially reductions of Life Cycle Cost (LCC), COTS risk management, and business/management process support, get identified to this group as often as possible. This group is also responsible to make sure the needs of the Fleet are met in a cost effective, continuous manner, which is consistent with the priorities they have identified. The attributes of the SSB system and its products play into several of the set priorities such as availability, interoperability, maintainability,

and supportability to name just a few. The SSB Team will identify the set of priorities and find the biggest problem areas where the SSB system products are applicable, then craft potential solutions to a few of these showing how the priorities will be met and highlight the resulting reduction in LCC. The report should be presented to the Resource Sponsor community as an example of potential possibilities and how with the “Right” policies in place, the effort could be duplicated and implemented.[cost - one third of a man year $200,000/3 = $67,000]

Independent Assessment

Identify the primary informational sources research the Resource Sponsors use as a community to base their funding resource decisions on (i.e. MIT study, GAO report, Fleet feedback, expenditure reports, etc.). Once the primary information resources are identified, commission an independent study focusing the work in application of the SSB system to solve the aforementioned problems. Direct the independent assessment to focus on and use the informational data sources the group usually relies on as comparison/contrasting base information with the outputs of the SSB system evaluation. Provide this independent assessment report to the Resource Sponsors community using as large a distribution as applicable boldly stressing both the data source and the independent nature of its generation.[cost - $125,000]

Success Stories

Getting success stories in front of this community is important and the use of the usual printed publications will be done as mentioned above to illustrate these successes. However to make a more lasting impression the stories need to be told in a more convincing context. The SSB Team understands that the Resource Sponsor community presents regularly to various audiences to get the word out on their initiatives and priorities. Since the Resource Sponsor will already be present at these meetings, if the speaker just prior or just succeeding his or her presentation, was to present the success story of the month resulting from the SSB system, it would be a non-intrusive way to get the word out. [cost - expected to be already incorporated in conferences above]

Authoritative Show & Tell

Prepare a presentation to give to the entire community during their annual meeting conference. Co-present the material with a very well respected industry leader like a prime contractor, OEM, and other SSB participants focusing in on the impact to these entities while touching on the communities needs and priorities. The proceedings and the presentation will be published and provide a documented resource to the community.[cost - see conferences above]

Activity 4 – Address NAVICP Contracting Policies Threat

The Direct Approach

As identified in the SWOT analysis the threat created by the implementation policies put in place by NAVICP can be dealt with using several avenues. The preferred approach is to provide the NAVICP leadership with the analysis presented in this plan, then work collaboratively with them to modify the current policy. To initiate this approach will require first finding the right group of decision makers to present the information to. Once identified the decision makers will be provided the information to study prior to a face-to-face meeting. The face-to-face meeting will be important in gaining credibility and expedite information exchange and communication. As part of the logical argument in substantiating the claims made in the analysis a presentation on the SSB system will illustrate the potential gain to the Navy through changing the current policies. Included in the material presented will be the methodologies and results from the Business Case Analysis (BCA) which should be of special interest to the NAVICP audience. Furthermore special examples of successful implementation efforts showing how the government unique position yields positive attributes for the Navy that are unobtainable if attempted through a contractor. The issue of "conflict of interest" should also be addressed through the presentation materials showing specific examples based on implementation experience. The expectation of this meeting has a lot a variability ranging from being thrown out of the office to NAVICP embracing the SSB system as a preferred alternative. [cost - $1500 per trip for 1 trip (travel costs) = $1,500]

The Customer Request Approach

Identify one of the programs that have a requirement to place their next contract on a Performance Based Contract (PBC) or a Performance Based Logistic (PBL) contract with a contractor and is willing to implement the SSB system. Partner with the program in addressing the issues threatening the use of the SSB system. The meeting format is as described as above but with the additional inputs from NAVICP's customer the PMO. [cost - $1500 per trip for 1 trip (travel costs) = $1,500]

Reporting Up the Chain of Command Approach

This approach can be used in parallel with either of the approaches listed above or accomplished independently. As describe earlier in this plan the issues will be presented in a concise written format and forwarded to ASN for review, interpretation and possible intervention. Once the actions are accomplished by ASN the expected next steps will depend on the ASN's findings. If the answer comes back with "No Policy Change Needed" then other avenues need to be addressed (i.e. Direct Approach, focus on program relationships, etc.). Should ASN agree that "Yes a Policy Change is Needed" then the next step will depend on how much involvement ASN will have in making the necessary changes. One possibility is that they take the lead and request NAVICP make appropriate changes independent of our involvement. Another possibility is to respond to our request directly back to us with a written interpretation and we at that point would need to work out the details with NAVICP in changing the policy. The impact of the NAVICP policies is so large that to do nothing will be detrimental to the SSB system acceptance. The impact justifies the risk in making the request and attempting to change the current policies.[cost - no cost impact in making the request considered a part of staff normal function]

2. Promotion Plan for Group 2, GateKeepers / Middlemen / Intermediaries

The evaluative criteria for Group 2 are 1) meeting the PM expectations as illustrated in Figures 8 & 9, 2) a process that is easy to use, 3) provides solutions which take into account the time dependency of the solution space, 4) generally this group is looking for quick returns to capitalize on the success for personal/professional gain.

This group represents the implementers of other groups policies and initiatives, as such, this group tends to take a “wait and see” or “ let someone else test the waters” thereby entering the market cycle much later, participating as Early Majority - Late Majority. Meeting goals and objectives of their command structure takes priority in accomplishment of their function and the less risky the method the better, since the establishment has as its foundation a risk avoidance mentality. Continuous personnel movement through these positions produces high turn over rate and therefore the people in these positions focus on the quick return on their efforts. The use of the Persuading strategy as the promotional objective will be most effective when coupled with personal selling (Face-to-Face) and potentially the use of Sales promotions. However in government business activities the Sales promotions are a bit different than implemented in the commercial industry. The Sales promotion here is more of a marketing of the accomplishment or work done by the specific person one is interacting with, for example a success in implementing the SSB system will be advertised in the SSB Team newsletter to all the Navy Program Offices and Resource Sponsors, with special attention to highlight the implementing personnel with name, position, quotes and picture. Using this approach we provide a promotional method to enhance the personal value or marketability of the involved personnel.

Activity 1 – Newsletter

The SSB Team will define a distribution of the Newsletter to cover not only all groups identified within this marketing plan but to the government entities across the board, DoD, non-DoD, and the associated contractor and industrial / commercial entities who interact with our market segment. The Newsletter, although specific format is yet to be determined, shall focus on delivering special sections covering the needs, interest and desires of each of the consumer segments we have identified (Decision Makers – GateKeepers / middlemen / intermediaries - Using Community). The approach may be different in addressing each group, for example; the Decision Makers section will dwell on providing information, the GateKeepers section will focus on selling the people, the Using Community section will post usable tidbits of information or post the winners of this months Most Valuable Performer (MVP) an award sponsored by the SSB Team. [cost – one fifth of a man year, $125,000/5 = $25,000 + monthly publication costs of 12

months times 5,000 copies per month times $0.20 per copy + $600 set up charge = $12,600, distribution costs not included, TBD]

Activity 2 – A Meeting Place

All implementers regardless of focus have a need to network with other sharing in the same misery, specifically for this segment group who are searching for leverage in the pursuit of professional gain and acknowledgement. The web site for SSB system support for the SSB community or also known as “SSB Web Central” is maintained by the SSB Team to initiate and promulgate on-going discussions to enable the communities networking efforts. This web site is augmented with an “Answer Garden” providing past efforts in dealing with SSB issues and projects, included in this searchable data base are such things as lessons learned, Navy internal best practices, Industry Best Practices, Transitioning Planning documentation, related internal Navy resources and did we mention the SSB Team Newsletters, etc. The SSB Team will keep account of and trend all “Cookies” of visitors and prepare an analysis report to share among the staff. The SSB Team staff will also monitor the site content and participants comments. These efforts are meant to craft the environment for the COTS community to entice the evaluation and trial of the SSB system at minimal risk. [cost - $40,000 initial set-up and license fees, $10,000 per year maintenance cost, no cost impact on the monitoring considered a part of staff normal function]

3. Promotion Plan for Group 3, Using Community

The evaluative criteria for this group deals with implementation details and probable outcomes, these criteria are: 1) ease of use, 2) visibility into the process, 3) risk identification and management, 4) a resolution centric process methodology.

This group because of the function they perform is all over the map when it comes to adopting of a product. These people are the true implementers of support solutions, living with and solving, the issues and challenges of the COTS products that someone else buys as a result of a policy decision made at an even more removed hierarchical level within the Navy. This group by necessity is a task orientated, technically driven, application focused community of problem solvers. As identified in the External Environment – Competitive forces – this community has over time,

developed its own culture exhibiting some specific characteristics. Not all members of this community have organized into well-defined structures/teams/working groups but they too can and do exhibit many of the same characteristics as the well-established teams. The Using Community has great influence with respect to which alternatives are chosen, how they are implemented, and the strategic approach to obsolescence risk management. Depending on individual members relationship within this community, the marketing methods already identified (i.e. conferences, publications, Point-Counter-Point written discussions etc.) have probably provided exposure to the SSB system. This community has a need to keeping up with the latest processes, methods, and tools employed to support fielded systems and therefore will seek out the kind of information we have placed in their environment. Driven by their functional positions, this community will be intensely interested in the News Letters and SSB Web Central, if and only if the content of the information addresses the actual implementation and problem resolution aspects of support.

Activity 1 - SSB Web Central

In an effort to service the market segment, a substantial portion of the SSB Web Central will be set aside to provide focused implement able solutions, success stories, detailed analysis of other PMO implementation efforts, and tailored SSB system implementation planning with Lessons Learned. Also posted and of great interest will be the yearly summary reports showing how over time the SSB system is performing. A "Discussion Board" will be provided and monitored to encourage networking and information sharing. The Using Community section will post usable tidbits of information or post the winners of this months Most Valuable Performer (MVP) an award sponsored by the SSB Team. Current and historical copies of the News Letter will also be available at the site. [cost – as identified in previous section]

Activity 2 – Most Valuable Performer (MVP) Award

The SSB Team will establish an award to be given to the implementing community to recognize its outstanding performers with respect to SSB system implementation. The criteria for nomination, acceptance and down select shall be developed by the SSB Team. However the criteria shall cover all aspects of the processes, methods and tools, so that singular parameters like reductions in LCC will not drive the

awarding process. In this way all implementers have a chance to receive the award such as exceptional tools, very effective implementations by small programs, innovative methods, etc. [cost – TBD – recommendations by the SSB Team and endorsement by management]

Activity 3 – Competition Forces Addressed

The barriers and impediments institutionalized through the existing cultures evident in the User Community must be addressed to assure maximum market penetration. Four major areas identified in earlier sections of this plan need to be considered: Resource, Territorial, Contractual, and Functional competition. Each of these responses from individuals or groups will require analysis to identify the root cause, potential remedies, and possible data collection efforts to mitigate the concerns that provoked the response. The SSB Team will perform research, analysis, provide recommendations, then publish in a "White Paper" format the results of the study. Some of the resolutions will come for logical analysis of data however several identified responses are behavioral traits which may require a completely different approach. Regardless of the resolution method, the "White Paper" report will be posted on SSB Web Central and a discussion thread will be initiated on the "Discussion Board" to elicit feedback from the community. The SSB Team shall make a special effort to be involved in the discussion thread to answer questions, collect data about our customers, and help break down the competitive force structures. [cost - Team authored - $4000 per report generation, times 4 reports = $16,000]

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VIII. LIST OF REFERENCES

1) Glum, Ted (2000). Support for the Warfighter. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

2) Robinson, David G. (2000). DSCC DMSMS Management. In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

3) McDermott, John T. (2002). "Reducing the Impact of Obsolescence in Military Systems." In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

4) Hartshorn, W.T. (2000). "Obsolescence Management Process as a Best Practice." In the Proceedings of 2000 NSWC PHD SMS Workshop, NSWC Port Hueneme CA, 7-8 November 2000. Retrieved August 3, 2002 from the World Wide Web: http://www.gidep.corona.navy.mil/

5) Plotkin, Martin S. (2000), "A New Industry – the Emerging DMS Market," COTS Journal, Volume 2 Number 7, pages 33-35

6) Overstreet, Robert E. (2002). "Process Mapping a Diminishing Manufacturing Resources and Material Shortages Reactive Management Strategy, A Case Study." In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

7) DUSD L&MR (2001) Deputy Under Secretary of Defense for Logistics and Materiel Readiness (2001), Memorandum – "Product Support Guide: Product Support A Program Manager's Guide to Buying Performance.". Retrieved August 4, 2002 from the World Wide Web: http://www.abm.rda.hq.navy.mil/

8) Cowley (2002) RDML (Sel) Bob Cowley, SC, USN, "Doing Business With the Navy." In the Proceedings of Congressman Frost's Procurement Conference. Presented in Arlington, Texas June 5, 2001. Retrieved August 4, 2002 from the World Wide Web: http://www.abm.rda.hq.navy.mil/Presentations/doingbusiness_cowley0601/tsld001.htm

9) DoD (2000) Department of Defense Directive 5000.1, "The Defense Acquisition System" October 23, 2000

10) DoD (2001) Department of Defense Instruction 5000.2, "Operation of the Defense Acquisition System," January 4, 2001

11) DoD (2001) Department of Defense Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs," June 2001.

12) King, John (2002), "DLA DMSMS Program." In the Proceedings of the DMSMS 2002 Conference, New Orleans LA, 25-28 March 2002. Retrieved August 3, 2002 from the World Wide Web: http://smaplab.ri.uah.edu/dmsms02/proceed.htm

13) NAVICP (2000) Naval Inventory Control Point Fact Sheet (2000), "Performance Based Logistics and Performance Based Logistics Business Case Analysis (BCA)." Retrieved on [June 2002]. http://www.navicp.navy.mil/03/036/0361/basicinfo.htm

14) DMEA (1999) Defense Microelectronics Activity (DMEA) Report (1999), "Resolution Cost Factors for Diminishing Manufacturing Sources and Material Shortages," ARINC Incorporation, prepared for DMEA under contract # GS-35F-4825G.

15) OMB (2001) Office of Management and Budget, the Executive Office of the President, Circular No. A -11 (2001), Appendix 8

16) OMB (1999) Office of Management and Budget, the Executive Office of the President, Circular No. A-76 (1999)

17) OMB (1999) Office of Management and Budget, the Executive Office of the President, Circular No. A-76 Revised Supplemental Handbook, Performance of Commercial Activities, (20 June 1999)

18) OFPP (1992) Office of Federal Procurement Policy, Policy Letter 92-1, "Inherently Governmental Functions" (23 September, 1992)

19) DUSD L&MR (2001) Memorandum, Deputy Under Secretary of Defense for Logistics and Materiel Readiness (6 Nov 2001), Product Support Guide

20) DUSD (1999) Office of the Deputy Under Secretary of Defense Report "Product Support for the 21st Century" July 1999. Retrieved on [June 2002] http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/lpp/assetts/product_support/report%20for%2021st%20century.pdf

21) Braun (2002) Email from Jerry Braun (Aug 2002), Percent COTS Products in Program Database

22) NAVSEA (2002) Naval Sea Systems Command web site, Home, Programs. Retrieved July 19, 2002 from the World Wide Web: http://www.navsea.navy.mil

23) NAVAIR (2002) Naval Aviation Systems TEAM, TEAM Profile, web site. Retrieved July 19, 2002 from the World Wide Web: http://www.navair.navy.mil

24) SPAWAR (2002) Space and Naval Warfare Systems Command Products. Retrieved July 19, 2002 from the World Wide Web: http://enterprise.spawar.navy.mil/spawarpublicsite/programs/alphaprolist.cfm

25) DoD (2000) Case Resolution Guide, Version 1.0 DRAFT (Aug 2000), Department of Defense DMSMS Working Group

26) NAS NAVSEA (2002) Naval Audit Service "Contractor Logistic Support at the Naval Sea Systems Command", Report Number N2002-0049 May 17, 2002

27) NAS SPAWAR (2002) Naval Audit Service "Contractor Logistic Support at the Space and Naval Warfare Systems Command", Report Number N2002-0069 August 8, 2002

28) DJSM (2002) "Changes to the Requirements Generation System," The Joint Staff Memorandum, DJSM-0921-02 dated 07 October 2002